McGraw-Hill DIGEST

JULY
1952

BUSINESS · ENGINEERING · INDUSTRY

Lighting Aids Production—Page 57

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It takes experience and job-tailored equipment to harness a river's horsepower . . . hurl that power cross-country so it can be used. Chile is making use of this potential horsepower.

At Abanico and Pilmaiquen Dams, G-E generators change flowing water into electricity. G-E line equipment, transformers, switchgear help speed this power to Chilean industry such as Huachipato's G-E equipped steel mills. Chilean homes and farms benefit too.

Beyond equipment, G.E. is proud to contribute know-how for development and use of power. G-E facilities and representatives around the world are ready to help you with electrical needs and problems, efficiently and dependably.

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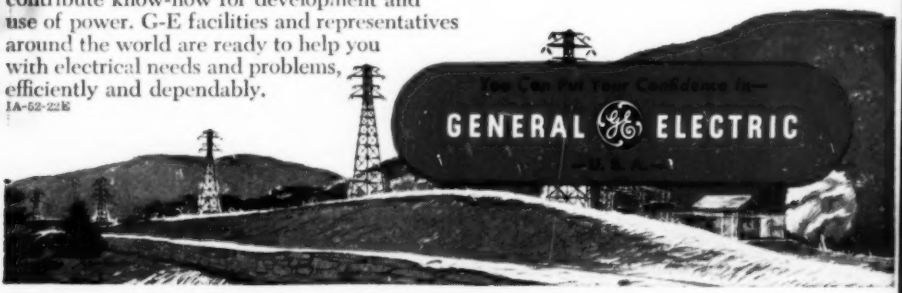

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This familiar seal—and the banking service it represents—is known in a dozen great world centers of commerce and industry.

To importers, exporters, bankers, businessmen, and private individuals, Bank of America brings the complete, *experienced* service that means so much in the transaction of international business.

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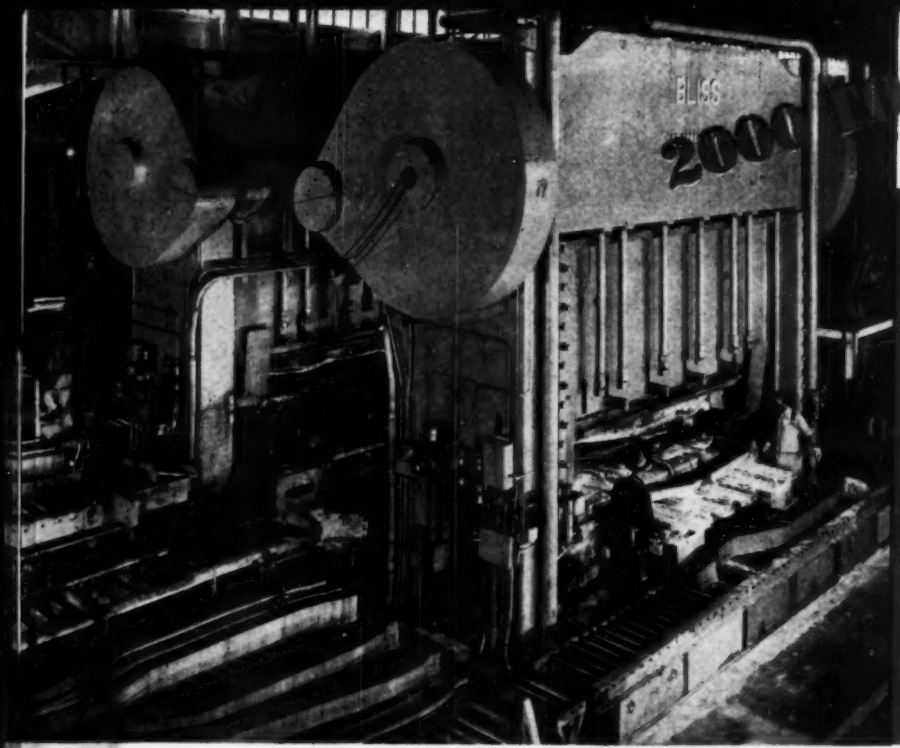


2000-ton Bliss presses, recently installed, form and trim heavy rails at the Dearborn plant of the Ford Motor Company.

New Bliss Heavy-Tonnage Presses Join Ford Production Lines

Ford production lines' ever-increasing efficiency and **reliability** are no accident. They embody intensive studies of advanced equipment and techniques—especially in heavy-tonnage forming where improvement gives substantial savings. A case in point is the *new rail press line*—five Bliss 2000-ton presses recently installed by Ford.

Unusual design features provide capacity to spare **and** protection against downtime even with steady 'round-the-clock operation:

- Extra-deep crown, bed and slide members minimize deflection
- Crankshaft construction withstands most severely unbalanced loads
- Crankshaft jointed at center; simplifies maintenance, cuts down on floor area needed
- Twin pinions and intermediate gears distribute load on intermediate shafts
- Oversize crankshaft, clutch and brake reduce possibility of downtime

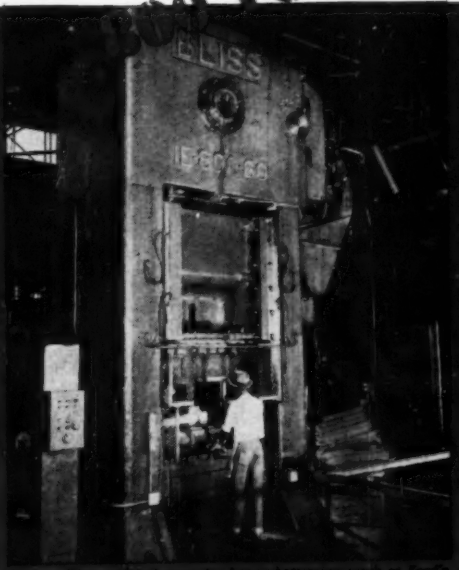
These design highlights show how Bliss' creative press engineering is applied to particular metal forming operations. *You* can get Bliss started on *your* special press engineering by calling your local Bliss representative.

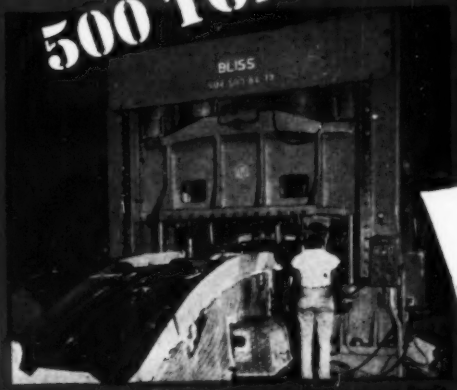
E. W. BLISS COMPANY

Presses, Rolling Mills, Special Machinery

Export Division: 50 Church St., New York 7, U.S.A.

Works at: E. W. Bliss (England) Ltd., Derby, England; E. W. Bliss Co. (Paris), St. Ouen sur Seine, France; Canton, Toledo, Salem, Ohio; Hastings, Mich., U.S.A.





For Heavy-Tonnage Presses—
Mechanical or Hydraulic...

It's Bliss

W&T Chlorinators in a large municipal water plant.

Picture
of W&T
at work....

for the
Community

Through the years, Wallace & Tiernan processes and equipment have earned a place of esteem in many phases of industrial and community life.

For example, in the field of sanitation, W&T Chlorinators are well known internationally for dependable, economical performance. Whether it be sterilizing a municipal water supply, chlorinating sewage, treating industrial wastes, or safeguarding a swimming pool, Wallace & Tiernan has proven equipment — specifically designed for each particular service. That's one reason leading engineers everywhere so often say, "Chlorination by Wallace & Tiernan."

Write today, without obligation, for technical literature on W&T Chlorinators for every municipal need.

WALLACE & TIERNAN PRODUCTS FOR COMMERCE, INDUSTRY AND THE COMMUNITY

Ammonia Control Apparatus—Cathodic Protection Systems—Chlorinators—Chemical Feeders—Decay Control Processes for Produce—Electric Marine Beacons—Flour Processing Chemicals—Magnetic Separators—Pharmaceuticals—Precision Instruments—Sifters.

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NEWARK 1, NEW JERSEY, U. S. A.

F-90

OVER THE PAST 5 YEARS— BOUGHT BY MORE PEOPLE THAN ANY OTHER MAKE

Here is why the Willys Station Wagon has consistently outsold all others since its introduction in 1946 . . .

It is both a comfortable passenger car and practical utility vehicle, with room for six people and luggage—has space for big, bulky loads when seats are removed. It combines sparkling performance with low operating costs—is built to give dependable, carefree service.

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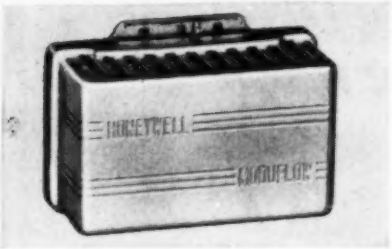
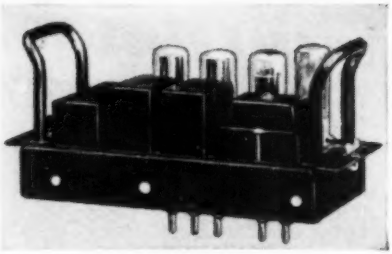
Toledo 1, Ohio, U.S.A.

For Stores, Offices, Theaters, Restaurants



Electronic thermostats – have no moving parts to wear out.



Electronic relay amplifier – magic "brain" of this super-sensitive system.

New Electronic Air Conditioning Control

New Honeywell system is 100 times more sensitive, provides the ultimate in comfort, gives increased efficiency, requires little maintenance

Minneapolis-Honeywell, famous name in controls, now has on the market a completely new type of air conditioning control. Tests have shown this new electronic system provides vastly improved comfort and amazing operating efficiency.

The system "feels" temperature changes the very moment they occur, and compensates immediately with either additional heat or cooling.

Reason for superiority. Simply because it is *electronic*, it's 100 times more sensitive than conventional systems. This means it gives faster reaction to changes in load; no temperature "overshoot"; no waste of warm or cool air.

It allows new methods of operation so equipment can be utilized at *peak* efficiency at all times. For example, change-over from heating, ventilating and cooling is accomplished smoothly without "jumps" in the control point. And the *simplicity* of Honeywell's electronic thermostat cuts maintenance costs to a bare minimum.

Write for full facts. For complete information on how Honeywell's new Electronic Air Conditioning Control can help make your store, office, theater or other public building more comfortable, write to Minneapolis-Honeywell, Dept. MG-7-142, Minneapolis 8, Minnesota, U. S. A.

MINNEAPOLIS **Honeywell**

First in Controls

Minneapolis 8, Minnesota, U. S. A.

BUSINESS TRENDS

U. S. INDUSTRIAL OUTPUT is due to start rising soon. In every month in 1952, except February, it has been lower than the same month a year ago. In fact, production dropped last July, stayed down right through 1951.

Military output has been rising all along. So has output of most machinery. But the consumer industries, especially textiles and consumer durables, have been wavering for a year. These industries slashed production a year ago when cuts in consumer buying made inventories pile up.

In the first quarter of this year, they thought consumers would buy more so output was increased. But consumers did not buy so output was cut again. Textiles were hardest hit. By April, output was running 25% below that of April last year.

Consumer-goods makers think they now have their problems in hand. They have cut inventories again. And they are making plans for boosting sales this fall and winter—when sales normally pick up anyway. Here is what manufacturers are doing, or planning to do, to increase sales:

• **They are cutting prices.** Distributors have been cutting prices for months. Now some manufacturers are following suit. Price cutting is a key move. Inflation has forced consumers to spend more for food and other necessities so they have not had the money to buy durables.

• **They are planning new models.** The old models, or slightly changed 1952 designs, have not been selling. New designs are selling well. Manufacturers are trying to get the 1953 designs out by this fall.

Consumers will have more money to spend this fall. That is one reason why manufacturers expect their new tactics to pay off. Big tax collections all come in the first half of the year. And another round of wage increases is underway. Last year, rising prices ate up all the increase in wages. But now prices are rising little so most of the wage increase will be an increase in "real" income.

Government has withdrawn its restrictions on consumer credit, too. Consumers can buy with smaller down payments, take many more months to pay off the balance of purchase prices.

The textile cycle should be turning about now. Textiles have been depressed for the last year. And the general pickup in consumer lines should

help the industries that sell to makers of consumer goods. That includes chemicals, plastics, paper, and others.

Exporters to the U. S. should benefit by the upturn in consumer sales, provided that they do not run into rising U. S. barriers against certain types of imports. But they would do well to follow the new policy of U. S. business: keep prices down, emphasize new products.

BUSINESS NEXT YEAR? Will the U. S. economy be going up or down? Economists are not agreed on the answer. But the general expectation is that U. S. business is in for a series of readjustments—downward.

Declining capital spending by business is expected to be a chief cause of these adjustments. U. S. productive capacity is rising fast. In many lines, it already is great enough to meet any conceivable demand—witness textile mills, which turn out a surplus whenever they run at full speed for long. So need for new plant and equipment is declining.

Less capital spending means lower volume for industries making machinery and equipment. And that means a drop in one of the chief sources of personal income because capital-goods industries employ one-third of U. S. manufacturing workers, pay some of the highest wages in the nation.

Will the business decline be serious? Again, there is no agreement. But there are some reasons for thinking the decline will be arrested:

1. Part of the "readjustment" is taking place now—in consumer buying. Consumers should be buying more by 1953; that will take up some slack.

2. Federal taxes may be cut for both individuals and business. Tax rates are at record levels now. If they go down, both business and private individuals will have more money to spend. The key question for next year is likely to be: Do they want to spend it?

3. Construction will continue at near record levels. New construction will come to $31- to $32-billion this year. Industrial building ($2-billion now) will decline in 1953. But housing (about $11-billion) and public construction (another $11-billion) are expected to stay high.

4. Defense spending will be a little higher, though it may drop late in 1953. Total defense spending in 1953 may come to $55-billion, compared to about $50-billion this year.

Water line for hydroelectric plant at Largentière — France Photo—H. Lacheroy

Electricity and Petroleum...

partners in progress

One of the basic sources of real natural wealth and social progress, is a country's capacity to produce low-cost electric power. In achieving that aim, the electrical industry relies greatly on petroleum.

As wax and asphalt, petroleum protects the far-ranging cables that carry electricity's pulsing might. Petroleum lubricants are indispensable to the upkeep of all electrical equipment and today many communities, factories and farms are supplied with electricity generated by petroleum fuels.

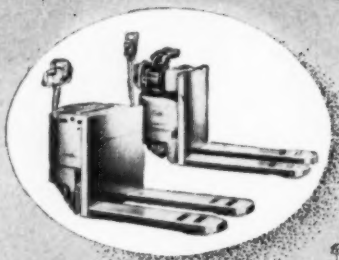
In these and many other ways ESSO petroleum products further the expansion of the electrical industry . . . thus bringing more comfort and convenience to people everywhere.

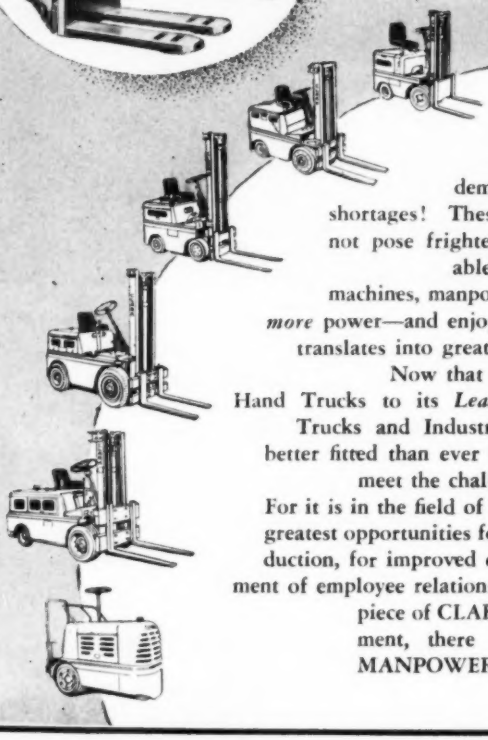
ESSO

PETROLEUM HELPS TO BUILD A BETTER LIFE

MORE *Power* for Manpower

IN EVERY CLARK MACHINE





STEADILY RISING COSTS — growing user demands — imminent labor shortages! These very real conditions need not pose frightening problems to alert and able management. Given proper machines, manpower can deliver a great deal *more* power—and enjoy doing it; more power that translates into greater production at lower cost. Now that CLARK has added Powered Hand Trucks to its *Leadership Line* of Fork Lift Trucks and Industrial Towing Tractors, it is better fitted than ever before to help Management meet the challenges of a most critical era. For it is in the field of Materials Handling that the greatest opportunities for savings, for increased production, for improved efficiency and for the betterment of employee relations are to be found. In every piece of CLARK materials-handling equipment, there is MORE POWER FOR MANPOWER. And it is yours to employ—yours to enjoy.

CLARK EQUIPMENT COMPANY • EXPORT DIVISION

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Other Plants—Buchanan—Jackson, Mich. Distributors in Principal Cities Throughout the World

WASHINGTON REPORT

AID AND TRADE still are monopolizing the economic limelight here. The administration, to save its foreign-aid and reciprocal-trade programs, is battling an election-minded, economy-minded Congress.

Administration forces in the Senate took the edge off the deep economic-aid cuts made by the House. Even so, it is now practically certain that economic-aid will be slashed by well over half a billion dollars by the time the foreign-aid bill gets out of the Appropriations Committee.

And the House has slipped a tricky amendment into the foreign-aid bill. It would require all economic-aid counterpart funds to be spent, whenever possible, for purchases of raw materials for the U. S. stockpile. This amendment would cost U. S. allies about a half billion dollars per year in lost dollar exports. It would cut counterpart available for investment in defense abroad by an equivalent amount. The administration hopes to get this killed before the final votes are in.

The administration and Congress are breaking about even so far in the fight over trade barriers (McG-H Digest, May, p13; June, p13). Section 104 of the Defense Production Act restricting cheese imports has been liberalized temporarily but may pop up in other legislation before Congress adjourns.

Senator Capehart's bill to halve imports of commodities containing scarce materials has been shelved. But he hopes to resurrect it before the session ends. The administration is making a determined effort to block this bill. It estimates it would bar 30% of British exports to the U. S., 42% of Belgian, 42% of Swiss, 20% of Italian, 16% of Swedish.

A duty increase on tuna imports now is practically certain. Several other measures have a better than even chance of getting through Congress. The administration is particularly worried about the effect on Japan and Germany. The Japanese already are reacting to U. S. moves to restrict tuna imports. They are reviving prewar export cartels to keep a foothold in the U. S. market by controlling export prices and quantities.

Many Japanese traders are thinking again of Red Chinese and Russian markets. Washington fears Mao and Stalin may soon tempt the Japanese with attractive trade offers. Some U. S. officials even expect Stalin to offer to return the Sakhalin and Kurile Islands to Japan in exchange for economic "cooperation". Long term, this would shackle the Japanese economy to the

Soviet Empire. The U. S. would have a tough time blocking a Japanese deal with the Communists if Japan cannot live by trade with the West.

The German situation is even more complex and dangerous. Washington will face two main problems once Germany regains near-sovereignty.

1. Germany will have to be assured of earning a living in the West.

2. Germany will have to be restrained from dominating the other Western European nations economically and militarily.

Solution of both these problems will require a liberal U. S. trade policy and continued U. S. aid—to Western Germany, France, and Britain.

Many Washington observers are not sure the West even then can win the struggle for Germany. Once the peace contract is ratified, Stalin will have more to offer the West Germans than will the West. Only he can give back Eastern Germany and Berlin. In the long run, offers of peaceful German unification and threats of war may wean the Germans from the West.

CONGRESS HAS LAUNCHED a campaign to push U. S. private investment abroad. The foreign-aid bill contains the following provisions:

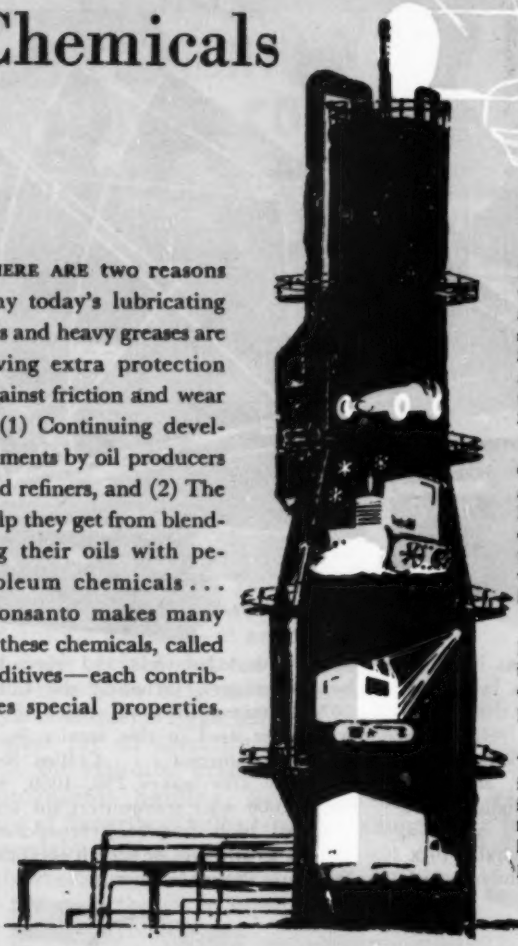
- **It requires** the Mutual Security Agency to develop programs to stimulate private investment in countries receiving aid.
- **It directs** the MSA to study foreign-investment barriers.
- **It calls for** faster negotiation of favorable treaties.
- **It instructs** the Technical Cooperation Administration to seek oportunities for U. S. private investment abroad.
- **It earmarks $100-million** for an International Finance Corporation to be affiliated with the World Bank (p19).
- **It earmarks $100-million** of counterpart funds to finance projects furthering increased U. S. investment abroad.

Latest economic studies of underdeveloped territories indicates that their economic development is falling steadily behind that of advanced countries despite Point Four and other modernization efforts. Washington fears that unless this gap can be narrowed by private investment, the Communists will take over the job of narrowing it by force.

Lubricants

extra protection

Chemicals



THERE ARE two reasons why today's lubricating oils and heavy greases are giving extra protection against friction and wear —(1) Continuing developments by oil producers and refiners, and (2) The help they get from blending their oils with petroleum chemicals . . . Monsanto makes many of these chemicals, called additives—each contributes special properties.

Higher viscosity indexes, meeting various specification requirements, are obtained from lubricating oil stocks through the use of Monsanto Santodex* . . . Rust prevention is a quality contributed to light petroleum products by Monsanto Santolene* C.

Corrosion and sludge formation are checked by the addition of Monsanto Santolube*—a group of additives that make it possible to develop inhibitor-detergent values in premium oils and heavy-duty lubricants.

Free-flowing and pouring properties in cold weather are added to lubricating oils by Monsanto Santopour* pour-point depressants.

To withstand shock and friction in modern motor cars, trucks and industrial equipment, refiners fortify their heavy-duty gear lubricants with Monsanto Santopoid* additives.

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Serving Industry . . .

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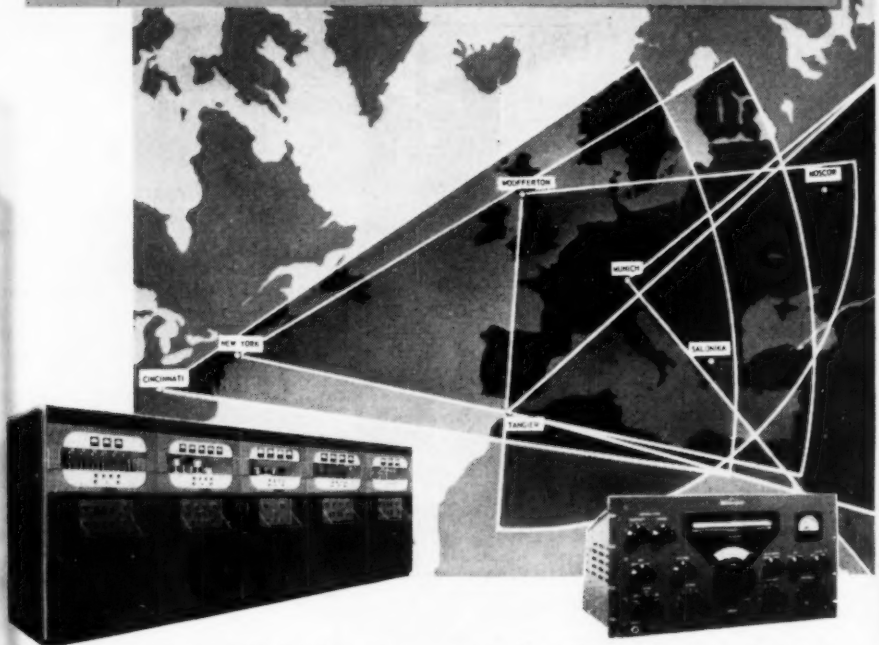
COLLINS' PART IN *THE VOICE OF AMERICA*



The Voice of America begins its penetration of the Iron Curtain by broadcasting on short wave from the United States. This signal is then relayed by short wave transmitters in Woofferton, England, Munich, Germany, and Tangier, North Africa, and by medium wave transmitters in Munich and Salonika, Greece. The United States signal is picked up by banks of receivers, among which are Collins 51J models, and rebroadcast by transmitters, including the Collins 207B-1 transmitters of 40 kw power which are used in this service by the Voice of America . . . Collins Radio Company also makes 250, 1000, 5000 and 10,000 watt transmitters for standard and high frequency broadcasting, as well as all types of speech equipment. Write us about your needs.

For quality in radio equipment, it's . . .

COLLINS

COLLINS RADIO COMPANY Cedar Rapids 5, Iowa, U.S.A.

YOURS!
BETTER LIGHTING AT LOWER COST

A WORLD LEADER SYLVANIA IN LIGHTING

... thanks to 50 years of Sylvania research and manufacturing skill!

Many of the "miracle" lighting developments of the past half century took place in Sylvania laboratories and factories.

For example, Sylvania was first to design and manufacture a complete fluorescent lighting fixture. Today, Sylvania offers the widest choice of industrial, commercial and domestic fixtures.

Sylvania developed the first 7500-hour fluorescent tube. As a result, you can now buy fluorescent tubes which last three times as long as ordinary brands—at no extra cost.

In the field of incandescent lighting, too, Sylvania boasts an outstanding record. Today, Sylvania makes light bulbs of all types in all sizes for all uses. Each is precision-built . . . for long-life, bright light.

In photographic lighting, Sylvania's complete line of Superflash bulbs is world-famous for dependability and quality.

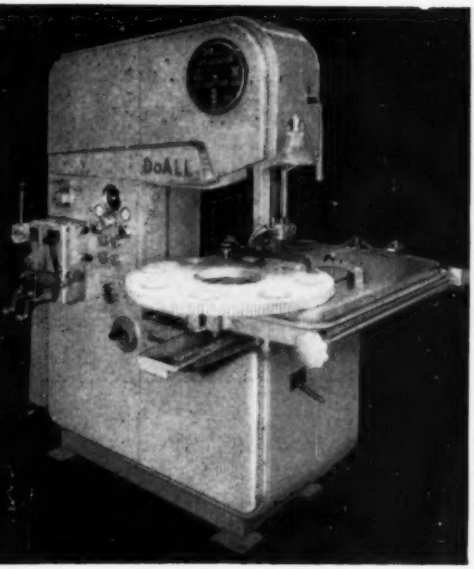
Sylvania research is a continuing operation. So for the good things in light, always look to the leader—Sylvania.

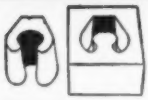
SYLVANIA ELECTRIC

International Sales Division, 1740 Broadway, New York 19, New York, U. S. A.

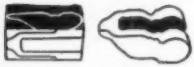
WORLD'S FASTEST PRECISION METHOD OF REMOVING METAL AND OTHER MATERIALS

DoALL Band Machining





FOR DIEMAKING—often punch and die can be made in one operation.



FOR SHAPE CUTTING—eliminates need for costly castings or forgings when relatively few pieces are needed.

FOR SHEET METAL PARTS—stack the metal and contour saw it. Also for making TOOLS, FIXTURES, JIGS, PARTS.

• MACHINE tools with continuous cutting blades slice apart metal instead of whittling away one chip at a time. Band Tools are available to saw, file, polish, grind or hone. A DoALL Band Machine will cut any shape, any material—fast and at low cost. It is a dozen machine tools in one. Will handle special pieces or production runs. Anyone can operate a DoALL. Every shop needs one or more to increase output and save money on production, toolroom or maintenance work. There is a complete line—a size, piece and style to meet every requirement. WRITE FOR CATALOG.

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International Financing Plan To Help

Private Foreign Investment

WASHINGTON — A new scheme to stimulate international private-capital investment in underdeveloped territories is taking shape here. It is a proposal for an International Finance Corporation affiliated with the World Bank. Capital would come from the bank's member governments.

The bank has reported favorably on the idea to United Nation's Economic and Social Council. The Foreign Affairs Committee of the U. S. House of Representatives has given the project a surprise boost by spontaneously earmarking for it $100-million worth of foreign-aid funds.

The U. S. government still has not endorsed the scheme officially. But it is expected to back it, particularly as an alternative to a grandiose UN-proposed development scheme that the U. S. opposes.

Timetable for Progress

All this support does not mean the International Finance Corporation will open for business anytime soon. The proposal will have to plough through complicated negotiations before it can become a reality.

The most probable timetable is this: The Economic and Social Council will consider it this summer and refer it back to the World Bank for further study. The bank's board of governors will take it up in earnest at its annual meeting in Mexico City in September. If the board approves, negotiations between the bank and member governments will follow.

From 12 to 18 Months

But the project is off to a good start. Chances are good that it will get underway within 12 to 18 months. But there are two main prerequisites for creation of the corporation. The U. S. will have to back it to the hilt, putting up roughly 30% of the initial capital. The project will have to get substantial support from the business communities of the major western nations.

The project could not achieve its objective of stimulating the international flow of private capital without the confidence and active backing of private investors. Robert L. Garner, vice president of the World Bank, is actively soliciting comments from western businessmen.

Here is what the International Finance Corporation would do:

1. It would help finance private productive enterprises in its member countries, particularly in underdeveloped areas, through equity investments and loans without government guarantees.

2. It would bring together investment opportunities, domestic and

foreign capital, and experienced management — drawing heavily on the facilities of the World Bank for this purpose. Its own capitalization would be relatively small—about $400-million of which maybe only one-fourth would be subscribed at the outset.

3. It would try to revolve its capital as rapidly as possible through resale of profitable portfolios.

The corporation would not accept managerial responsibilities in enterprises in which it invested. It would always be a minority stockholder. It would provide merely marginal capital that private investors interested in a new project could not raise. It would not compete with private investors, but invest only in projects for which other financing was not available.

IFC to Provide Risk Capital

The corporation's operations would be essentially speculative. It would provide risk capital. So its profits would have to be high enough to cover possible losses. Net profits would be distributed to member governments in proportion to their subscription to the corporation's stock. The speculative character of the corporation's activities probably would tend to concentrate them in the field of industrial investment.

Here are some examples of how the corporation might work:

• **An American company** wants to open a plant in a Latin American country. The project needs $3-million capital for imported equipment and $1-million for local expenses and working capital. The American firm has plenty of capital but no foreign experience. It wants to be protected against discriminatory treatment through participation of local investors and the corporation.

The American company is willing to invest $2-million in the project. So it would ask the corporation to find suitable local investors and to invest itself whatever part of the remaining $2-million cannot be raised locally.

• **A group of investors** in an underdeveloped country wants to start a local fertilizer plant costing $5-million, but they have only $2-million. They ask the corporation to raise the remaining $3-million and to find experienced management.

The corporation locates an experienced fertilizer firm that is willing to provide management and $1-million if it can get a chance to buy control of the new company at a later date. The corporation agrees to put up a $700,000 loan and $1,300,000 in equity capital. It also agrees to give the established fertilizer firm a first refusal on the purchase of its stock within 5 years.

• **A member country** of the World Bank asks it for a loan to finance a government - owned - and - operated cement plant. The member government would rather have the plant privately owned and operated. But it has been unable to interest any private investors in it.

The bank knows of a reputable cement company that would put up some equity capital but does not

want a loan guaranteed by the government as required by the bank's charter. So the corporation would give the cement company a non-guaranteed loan convertible into stock.

Capital Flow Is Dammed

These examples illustrate how the corporation would spur private foreign investment and fill an important gap in international investment machinery. It would help because the international flow of private capital has been constricted since before World War I by these factors:

Local capital markets have not flourished in underdeveloped countries. Risk capital has tended to dry up in the economically advanced countries. The flow of private capital from Western Europe has been pinched off by two wars, the depression, and the increasing economic dominance of the U. S. Government controls on currencies, exports, imports, and prices have discouraged private foreign investors, and a growing number of underdeveloped countries have tended to discriminate against foreign capital.

Existing international investment machinery has not been able to reverse this trend. Foreign-investment organizations are restricted to certain regions or currencies. The U. S. Export-Import Bank makes loans only to foreign government and government-sponsored projects, but can make no equity investments. And the World Bank is limited by necessary government guarantees, not being able to make equity investments, and being allowed to make foreign currency loans only.

The International Finance Corporation would not be hobbled by such limitations. And its international character and close affiliation with the World Bank would generate confidence in its projects, both on the part of the foreign investors and of the government concerned.

The fact that the corporation would be able to invest local as well as foreign currencies would help in many countries where local capital markets are embryonic or non-existent. It also could directly encourage the development of local capital markets by investing in local finance corporations.

Multilateral financing operations also would be possible. It could invest, for example, some dollars, some francs, some pounds, and some cruzeiros in a Brazilian project, provided that the equipment could be profitably imported from the respective currency areas. And the corporation and its members might earn net profits in dollars on non-dollar investments if the project concerned exported to the dollar zone.

Opportunity and Know-How

Lastly, the corporation, through its affiliation with the World Bank and its close contacts with member countries, could be effective in bringing together investment opportunities and technical and managerial know-how. The World Bank in the past has had many inquiries from poten-

tial investors and from groups with interesting investment projects that it has not been able to follow up.

There would be a lot of growing pains, of course. Foreign-exchange shortages in many countries would hamper repatriation of the corporation's profits. The minority stockholding position of the corporation would endanger its funds if it did not choose reliable partners.

Resale of portfolios would be a delicate business. Local investors would protest in many cases if sale of the corporation's stock involved giving foreign interests majority control of enterprise. The corporation probably would have to agree in many instances to give its original partners first refusal options on sale of its stock.

Reactions so far to the International Finance Corporation proposal have been mixed, although a majority of the governments and individuals questioned by the World Bank have favored the idea.

State vs. Treasury

U. S. officials are divided on the merits of the plan. State Department and the Mutual Security Agency favor it. The Treasury so far is cool toward as it would mean spending more U. S. taxpayer's dollars. The project seems to have vigorous support in Congress.

Foreign governments informally approached so far have been sympathetic. Some of them are hard-pressed economically and reluctant to subscribe capital to any international organization. But the amounts involved would be small and the governments would probably go along in the interests of bolstering their economic prestige abroad.

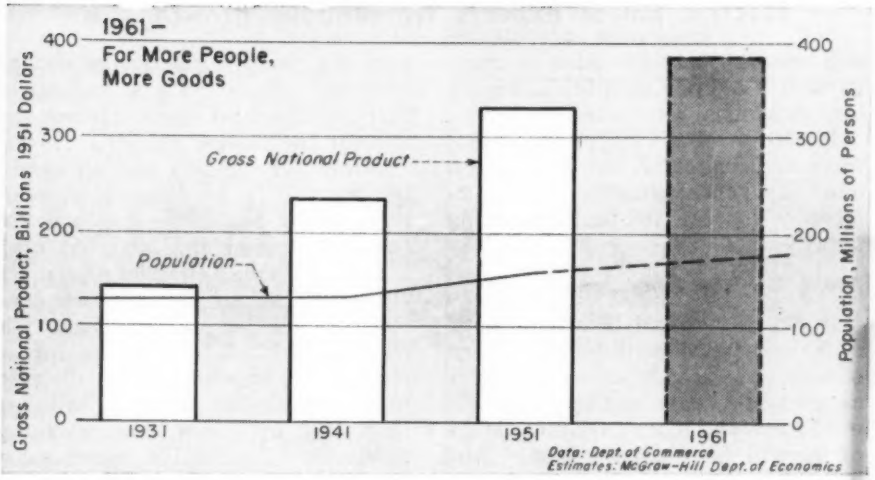
Most foreign businessmen questioned by the World Bank are interested in the idea. But it is too early to tell how they will react when the details are worked out. Business interests in many countries are suspicious of foreign capital. Also, local capital markets are tightly cartelized in many places. Local investment groups may not like the corporation's encouraging independent local investors to enter the capital market.

Businessmen Like The Idea

Most of the U. S. businessmen questioned have liked the International Finance Corporation idea in principle. But an articulate minority says it would encourage socialistic government intervention in private business.

Partisans of the scheme argue that: The international character of the corporation would keep national politics out of it. The corporation would not have a controlling interest in any of its ventures. It would not even have a vested interest in them because its capital would revolve. It would invest only in projects that could not find exclusively private financing. It would encourage independent private investment abroad by creating better investment climates.

The consensus among Washington economists is that the scheme is worth trying. They feel that unless private western capital can be mobilized for rapid development of backward areas of the free world, those areas eventually will turn to socialism or communism to do the job.



***AS POPULATION** increases so will gross national output. The trend is upward for the . . .*

U.S. Economy: In Ten Years

Growth of U. S. economy in ten years could mean worldwide prosperous conditions. Business men should watch for certain signs

THE NEXT TEN YEARS can see an expanding U. S. economy pave the way for better business the world over. More markets for more of the overseas businessman's goods can open up. And he can have more dollars with which to buy U. S. goods. The report that follows brings up to date a story that first appeared in the McG-H Digest, Aug '50, p17.

By 1961, total U. S. output of goods and services will be $300-billion—16% more than in 1951. Population will rise to 175-million from 1951's 150-million, with employment up 3.5-million to 67.7-million. And productivity will increase about 2% per year.

These are the key figures in an estimate of the U. S. economy by the McGraw-Hill Economics Department. They are based on the assumptions of no war in that period and reasonably full employment in 1961.

Nearly every industrial field has a substantial growth potential in the coming ten years. But two fields stand out: chemicals and electric power.

Heavy chemicals have just about reached their peak in growth. Expansion will come in the new specialty chemicals, particularly the synthetics. Synthetic textile fibers could double their markets by 1961. They

will replace wool and cotton in many garments and will go more and more into industrial products.

Plastics will no longer substitute for scarce materials but will have a new field of application by themselves. You can see that happening today.

More Oil for Chemicals

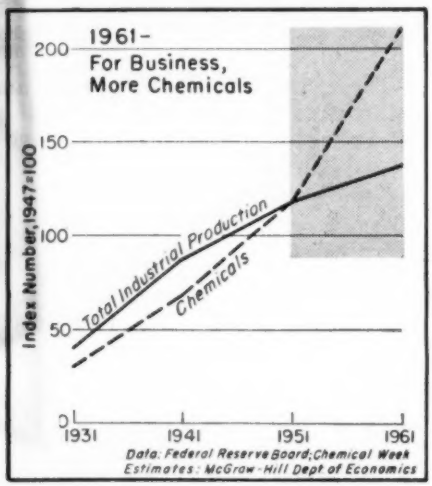
In ten years, half of all synthetic organic chemicals will be made from oil and natural gas. More and more cars, trucks, buses, and airplanes will need more and more gasoline. Much of it will be higher octane. And diesel fuel demand will rise, too. So refineries will continue to turn out their conventional products but in increasing quantities.

The electric-power industry also expects tremendous growth in the next ten years. Electricity will be relatively cheap. Those industries that use the most electric power are due for the fastest growth.

Power for lighting and air conditioning will be in demand. Stores, restaurants, and offices may call for twice the power that they do now.

In the home, electric power requirement is due for a tremendous increase—double 1951. There is room in 90% of U. S. homes for an electric dishwasher, food disposal unit, and clothes dryer. And less than 40% of homes have television receivers. Aggressive merchandising is needed to exploit fully the opportunities that will develop in the electrical appliance field.

In the metalworking industries, some can look forward to an impressive growth. Others will fall behind. The major ones—vehicles, office machinery, agricultural machinery, and construction machinery—will keep in step with the national economy.



CHEMICALS are due for a steady climb far ahead of industrial production.

Minerals, Metals Growth Varies

The minerals and metals industries have varying growth potentials. A change in fuels and metals in use is due. Natural gas will grab most of the home-heating and industrial-fuel markets. But coal and fuel oil will still be needed and in increasing amounts.

Aluminum, magnesium, and titanium are sure to have large gains. Titanium, in particular, has great potentials. Better refining techniques may mean a consumption of half a million tons by 1961.

In the next ten years, the construc-

tion industry will see a shift from housing and defense construction to public facilities. Large increases will come in highway building and other heavy construction.

The phenomenal rush to build homes will slack off in a year or two. Fewer new families will be formed and most of the postwar demand will be met. But home construction will not end there. People will want to "trade in" their old homes for new, better housing. To foster this market, industry will use more mass production techniques in home building and replace city slum areas with apartment houses.

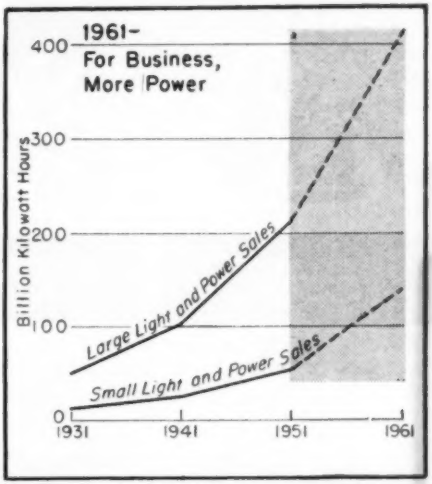
Population growth will stimulate demand for personal necessities—food, clothing, and housing. Makers of products consumed by people under 20 or over 60 will have greater sales opportunities because these sections of the population are increasing most rapidly. The consumer field may find its volume grown 25%.

Three important factors determine the general growth of an economy:

- Population growth.
- How much time the labor portion of population spends working.
- Productivity of the labor force.

Population growth means more people to buy more goods and demand more services. But keep this in mind: the fewer children born during the 1930's means more people in the 20 and 60 year brackets in 1961.

By 1961 more people will be working but working shorter hours. So an increase in national output would have to come from an increase in effectiveness at work.



***ELECTRIC POWER** will match business growth and be relatively cheap.*

Rising productivity will come from new machines and new methods. Constant industrial research will also add to the output of each worker, giving more for everyone.

Watch these factors, too, when seeking markets in the U. S.: employment trends, rate of wage increases, birth rates, productivity, population growth and shift, trends in consumer demand, and trends in the major industries.

But behind these factors lie national and international policies. Their impact can have tremendous effect on the economy. Watch them. So far the major political forces aim for maximum employment for a growing labor force. And the U.S. has committed its resources to the defense and economic development of the free world.

1 Commercial vacuums first became necessary in manufacturing light bulbs
2 Further advances in vacuum science made the radio tube practical
3 War brought new techniques for preserving blood and drugs
4 Post-war uses came fast. Television became a household item
5 ...And high vacuums were utilized to produce high-purity metals...
6 Now veterinary science uses vacuum for vaccine preservation...

SIX PHASES of high-vacuum engineering show the development of . . .

New Applications for Vacuum

A brand new science is developing—the technique of producing nothing and then putting it to work in making better processes

STUDY OF VACUUMS and their uses has become almost a science by itself. Recently the American Institute of Chemical Engineers held a symposium on technical aspects of vacuum engineering. Discussion stuck closely to theories and general problems. But these high-vacuum applications were revealed:

- A major oil company has made new adaptations of high vacuum in either petroleum refining or in by-products.
- Known vacuum methods for preserving drugs are being extended to preserving vaccines.

• High vacuum is finding applications in the steel industry and in refining of titanium and other metals.

• Some companies are getting more efficient refrigeration by means of vacuum; for example, a vacuum process removes air from between the leaves of lettuce to permit more efficient cooling.

• One company destroys moth larvae in furniture by placing the furniture in a vacuum chamber.

The current list of commercial uses of vacuum pumps dates back not much more than 10 years. The upsurge of electronics before World War II gave vacuum-pump development a big push.

The diffusion pump is still the commonest way to create a high vacuum. The principal: A jet of mercury will drag particles of air along with it from the vessel being exhausted. Modern pumps, however, have an oil jet instead of mercury. Such pumps have far extended the life of television picture tubes by removing more of the air that batters the inside of the fluorescent screen.

As World War II approached, researchers began looking into vacuum applications out of the electrical field. Distillation Products Industries pioneered in the field of vacuum distillation of fish liver oils to produce Vitamin A. DPI found that a degree of vacuum speeded the boiling off of the fish oils. By condensing the vapor, DPI achieved a rich vitamin product without the bulk of the original oils.

National Research Corp. got its foothold in the vacuum field by coating optical lenses for the U. S. Navy Bureau of Aeronautics. The lens-coating principle found other uses.

Coating methods all work on the same principle. The items to be coated—binocular or telescope lenses, or toys, or plastic ornaments—are placed in a vacuum chamber. The coating material also goes into the chamber, usually on an electric heating element. Air is exhausted, heat is turned on, and the material vaporizes. It condenses on the surfaces of the items to be coated.

Some toys get their shine from coatings applied by vacuum methods. The cost of the process is little—½¢ for one toy car. And the bright surface has such eye appeal to children that it may add 10 or 15¢ to the selling price.

High-vacuum purification produced the metals for the atom-bomb project, and high vacuum in the chamber between the poles of huge magnets makes it possible for a cyclotron to do its atom-smashing.

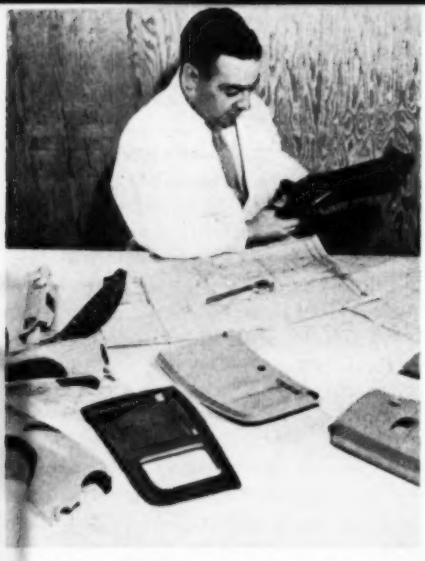
Frozen orange juice is concentrated by high-vacuum methods. More recently coffee has been concentrated the same way, and other foods and juices are joining the list.

During the war, high vacuum was applied to preservation of blood. It was found that some bacteria multiplied rapidly in blood when it was allowed to stand for a while. Blood was frozen, then subjected to a high vacuum that sucked out its moisture instantaneously. After that, the blood concentrate lasted well.

High vacuum is preserving live vaccines for veterinary purposes. That opens up a huge market of about 60-million hogs a year to be guarded against hog cholera.—Business Wk, May 24, p48

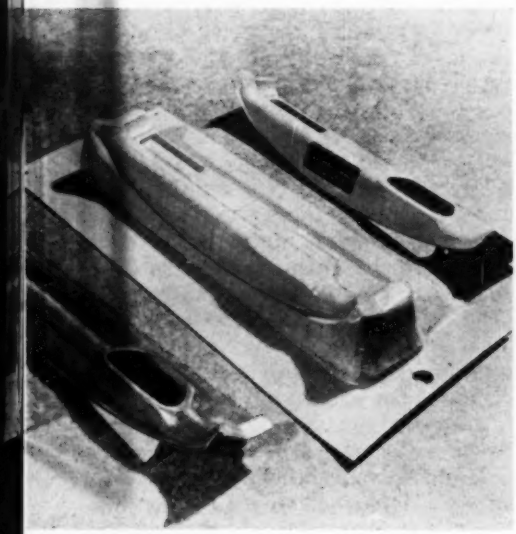
Plastiscale

Scale models made of sheet or cast plastic are helping tooling and production men at Ford Motor Co. to speed up tooling for model changes. Complex items are made into part- or full-scale plastic prototypes. Long before detailed drawings are finished, manufacturing personnel can study the models to solve the many problems that always crop up



PLASTIC PANELS stripped from form blocks reproduce contours, radii, bends, and trim lines. Model maker trims panels.

ASSEMBLY of plastic prototypes of stamped-metal structures is done with brass paper fasteners for easy dismantling.



INSTRUMENT-PANEL ¼-scale model at center is untrimmed, shows how metal will flow. At left is trimmed model, at right one for manufacturing study.

SIMPLER PRODUCTS can be engineered from plastic prototypes. Three-piece design at left required quite complex stampings. At right is a one-piece replacement.

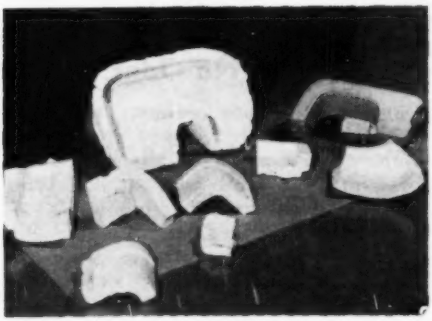
Prototypes

during tool tryout. Engineers can decide whether the design can be made on available equipment, whether there is accessibility for welding electrodes, whether mating is faulty or structures are weak. The prototypes are made over wood or plastic form blocks by applying heat and pressure or vacuum.—Am Mach, May 12, p159

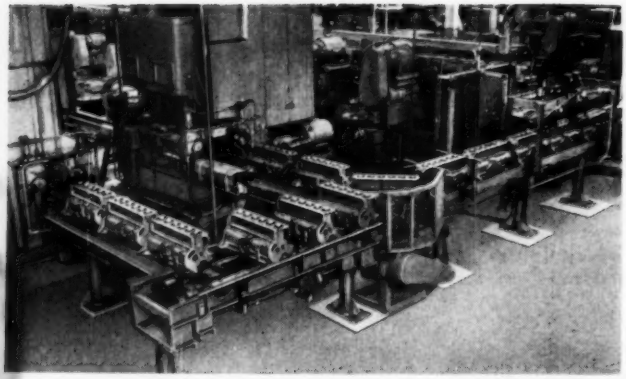
CRITICAL AREAS of a design can be made full size to check strength, weld location, weld accessibility—as for this cab.

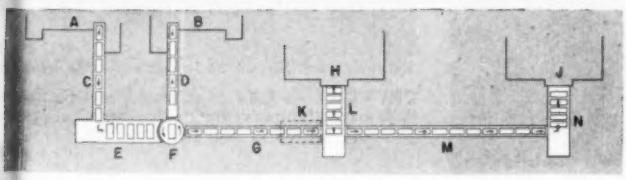
TRANSPARENT PLASTIC (here an automobile roof) is used when internal parts must be open to view for study.

SHIPPING EXPERTS use the models too for studying the nesting of assemblies and space economies. Visualization is greatly improved, shipping costs are cut.



PLASTIC FENDER-DIE model simplifies stamping problems. Model maker made eight-piece parting mold of plaster from master scale model of clay.





AUTOMATED LINE DOUBLES SPEED

Fully automated system at Ford Motor Co.'s new Cleveland engine plant moves cylinder blocks into and out of machines automatically. Rated capacity of line doubles that of best modern, semi-automatic lines. Blocks are pulled from boring machines A and B by shuttles C and D, and fed to shuttle E, rotation fixture F, and shuttle G (with jamming prevented by shuttle C controlling E and taking priority over D). Face millers H and J are loaded by overhead shuttle K feeding to shuttles L, M, and N.—Am Mach, Mar 17, p135

Moon Bounces Uhf Message Back to Receiver on Earth

Lunar reflection helped transmit a radio message for the first time during a recent experiment conducted by U. S. National Bureau of Standards and Collins Radio Co. Ultra-high-frequency signals sent from Cedar Rapids, Iowa, were reflected off the moon and received at Stirling, Virginia, 775 miles away.

The 20-kw. transmitter generated an operating frequency of 418 mc. Reflection from the moon began as soon as its leading edge entered the radio beam. In 10 min., the signal strength from the moon reached its highest value—about one millionth as strong as the signal received by most commercial television receivers.

To verify whether the signal was actually reflected by the moon, the transmission delay was compared with the theoretical value. The value calculated from relative positions of transmitter, moon, and receiver, agreed approximately with the actual 2.5-sec. delay.

The experiment points toward the possible use of the moon as a reflector for short-wave transmission that would be free from interruption.—Electronics, May, p194

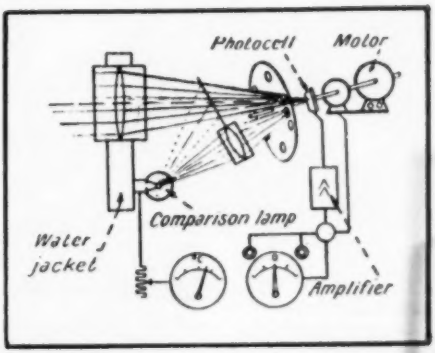
No Styrene, No Odor

Odorless synthetic rubber latex has been achieved by Goodyear Tire & Rubber Co. Up to now, the undesirable odor prevented use of synthetic latex in foam mattresses and pillows.

Research disclosed that styrene caused the odor. The new latex is polybutadiene, made by polymerization at temperatures considerably below those used for conventional synthetic rubber. It is as odor-free as natural latex, costs less, and is strong enough for intended uses.—Chem Wk, Apr 19, p54

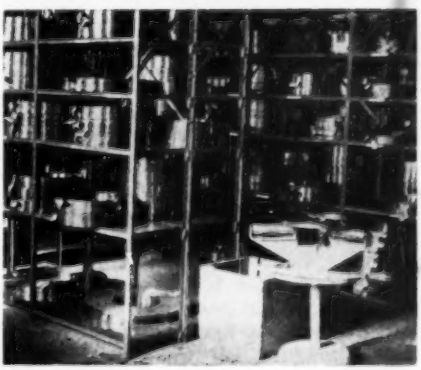
This Month's How To . . .

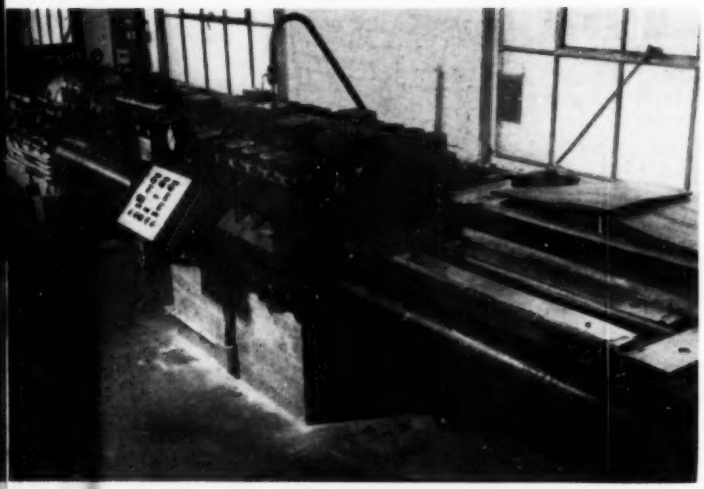
. . . measure work temperature during surface hardening is answered by a new instrument manufactured by Surfard Ltd., England. Rotating disk with holes in periphery alternately exposes photocell to radiation from work surface and radiation from standard filament. Filament radiation is adjusted so that at desired work temperature photocell will produce no ac. If there is a difference, ac. indicates direction of unbalance. Dc. generated operates switches on flame hardening machine.—Mach, Apr 19, p606



. . . measure thickness of ceramic coatings applied to nonmagnetic materials is accomplished by a new instrument built at Ryan Aeronautical Co. Its operation depends on change in inductance of a coil brought near a metal surface, which acts as a short-circuiting device. Probe coil, embedded in plastic head, is brought nearly into contact with ceramic-coated part. Space is adjusted until galvanometer reads "zero", as previously calibrated. This occurs when coil is displaced an amount equal to coating thickness.—Prod Eng, May, p230

. . . keep steel from rusting is easy with a dehumidifier. Kenilworth Steel Co. has held highly polished, completely degreased carbon steel in storage for a year without a sign of rust. The dehumidifier holds relative humidity in the storeroom to 40%. Walls and doors are not sealed. Under ordinary conditions, this steel would have started rusting within 24 hr. The company estimates savings in tangibles—labor, oil, and inspections—at about $2,000 a year. The unit at Kenilworth was made by Pittsburgh Lectrodryer Corp.—Factory, May, p108





FORMING PRESS

This Wheelon press, developed at Douglas Aircraft and made by Verson Allsteel Press Co., shallow-forms sheet metal by inflatable rubber bag. Advantages: 1/10th the size and 20% the cost of regular Guerin press; higher pressures reduce hand forming by 50%.—Am Mach, May 12, p202

Drawbench Moves Die

Useful, novel features have been incorporated into a drawbench made in Australia by Metal Manufactures Ltd., Port Kembla, New South Wales.

The machine differs from conventional drawbenches in that the tube gripper is fixed relative to the machine and the die, mounted on a moving carriage, is drawn over the tube or rod. One advantage claimed is that the machine need not be much longer than the material drawn. Multiple drawing can be done in both directions.

The drawn tubes come off the drawbench unusually straight. The principle of moving-die drawing can be adapted to a reversing chain-type machine.—Mach, May 17, p761

Home-Made Ferrule Puller

Ferrules are put into ends of waste-heat-boiler tubes to prevent corrosion and erosion, but they are hard to remove when they must be replaced. So Esso Standard Oil Co. at its Baton Rouge refinery developed a pulling device that does the job quickly.

The device consists of a heavy lever arm, pivoted near its center and mounted on a stand. A chain and hook are attached to one end of the arm. The hook engages a hole gouged in the ferrule. Applying pressure on the other end of the lever with a riveting machine pulls the ferrule from the tube.—Oil & Gas J, May 5, p275

Foam Cuts Shipping Losses

One year's experience with phenolic foam as a packing material for glass and other ceramic articles proved to user that the foam:

1. Reduced packing time.
2. Increased packer's efficiency by reducing worker fatigue.
3. Saved expensive warehouse space formerly employed for storing packing materials. Phenolic foam is made at the shipper's plant.
4. Reduced shipping charges.
5. Cut breakage of fragile ceramic products.—Ceramic Ind, May, p74

New Uses for Old Plastics

Plastics-industry annual exhibition featured proved materials in new applications. Some plastics had their properties changed

MAJOR EMPHASIS at the 5th National Plastics Exposition, held recently in Philadelphia, was on solid, proved applications and materials rather than on the new and novel. New materials shown were modifications of existing materials; new applications shown were either similar to existing applications or were just one logical step beyond them.

Some highlights of the show follow:

Plastics materials reinforced with fibrous glass were much in evidence. Outstanding were two sport cars with reinforced polyester bodies. Across the aisle from one of the cars was a 200-ton press made by Hydraulic Press Mfg. Co. for molding large reinforced plastic parts—perhaps prophetic of the day when plastic car bodies will be stamped out on huge presses.

American Cyanamid Co. displayed glass-reinforced polyester pipe. Thick reinforced polyester sheets and rods for applications involving machining were shown by Dynakon Corp.

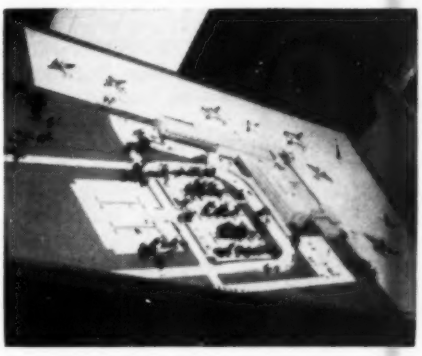
Rigid vinyl was shown by practically all the producers of vinyl. End products made of hard vinyl are still relatively scarce, except for extruded pipe and sheet material for fabricating ducts.

The Industrial Radiant Heat Corp. exhibited a machine for vacuum-forming thermoplastic sheet. The machine was designed for manual operation and employed an infrared superheater to soften the thermoplastic sheet prior to forming.

Improvements were noted in printing surface effects on vinyl sheeting and film. But greatly improved surface effects were not restricted to the vinyl field. Metallized acetate sheet is being embossed in many intricate patterns. Molded styrene wall tile is made with a surface like that of striated plywood.

Styrene copolymer sheet materials and their applications were much in evidence. U. S. Rubber Co. announced a new sheet material that withstands high impact at low temperatures. Low-temperature styrene copolymer pipe indicated that the low-temperature problem—in pipe—was solved.

Exhibits of the phenolic producers placed major emphasis on those applications where the material has already proved itself. About the newest thing at the show, as far as the phenolics



SAN JUAN TERMINAL UNDERWAY

Symbol of San Juan's increasing importance in the Western Hemisphere transport picture is model of the Isla Verde International Airport now under construction. Port is designed to handle a traffic load of 969,000 passengers by 1970. Main runway on the new field will be 7,500 ft. long and 200 ft. wide. Isla Verde is scheduled to be in operation early in 1954.—Aviation Wk, Apr 7, p68

were concerned, was a Durez platable phenolic material. It is a conductive phenolic specially formulated for molding articles that are to be plated. Fiberite Corp. showed new preforms that combine phenolic resin and fillers such as cord and asbestos.

In cellulosics, the outstanding exhibit was Tennessee Eastman's demonstration of the extrusion of 4-in. dia. butyrate pipe. Another interesting cellulosic extrusion was Gering Products, Inc's., "twist rod". It consists of a clear transparent rod with a controlled spiral of colored material running up the center of it.

In saran, Dow Chemical Co. showed a short staple fiber for carpeting. This fiber makes possible a 100% saran carpet that is as soft as any carpeting fabric, strong, dirt-resistant, and easy to clean.—Mod Plastics, May, p87

Stamped Rockers Cut Costs

Stamped valve rocker arms for valve-in-head engines are getting more popular. Compared with forged rockers, they cost less, require less machinery, are lighter, and can be made to closer limits.

Toledo Stamping and Mfg. Co. assembles rockers by projection welding. One end is tapped for an adjusting screw. The insert at the other end has a necked shank and is locked in by squeezing the metal of the stamping around the neck into the necked portion.

The bushing is locked by an upsetting operation after being pressed into place. This upsetting is done with a mandrel in the bushing so that the latter is not reduced in size.

Oil channels are coined into the stampings, and oil flow is controlled by restricting the channel or by beveling the edges. All operations are simple, fast, and well adapted to quantity production and assembly setups.—Auto Ind, May 15, p48

EMPLOYEE RELATIONS IN GERMANY

At the Bayer-Leverkusen chemical plant, a model shows a synthetic dress but a real smile to workers. It is part of a "fashions returning to their birthplace" stunt—showing employees how the materials they make are being used.—Chem Wk, May 3, p16

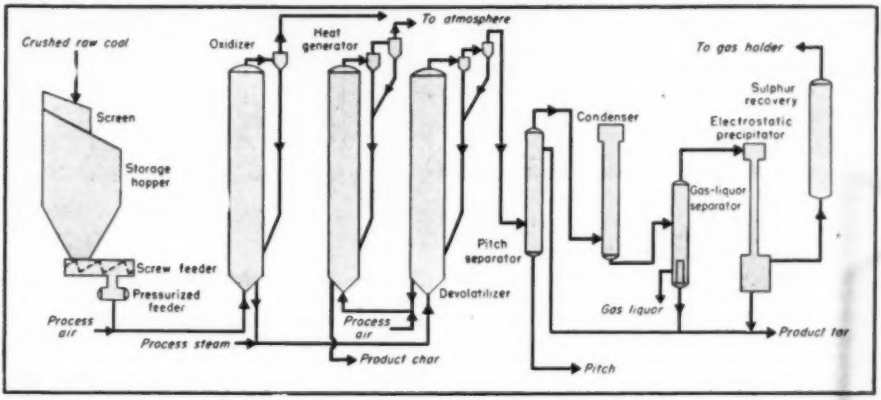
Foam in Control Surfaces

Plastic-filled control surfaces have been developed at Northrop Aircraft, Inc. No internal ribs are required with the new design. The number of rivets has been minimized, and surfaces can be built with greater strength for less weight than conventional designs.

The new process uses Dow Chemical Corp.'s Styrofoam as a filler. Beside weight saving, the Styrofoam acts as a vibration damper by filling the voids within control surfaces.

A special adhesive permits bonding the plastic to wood, glass laminates, fabric, or aluminum. Curing occurs under pressure. A polyvinyl alcohol bag makes pressure contact between surfaces.—Aviation Wk, May 5 p34

Coal Yields More Heat, More Products . . .



. . . when processed by a fluidization technique developed by Dr. Alamjit D. Singh of Singh Co. Process uses anything from lignite to anthracite. Typical yield from ton of soft coal is 1,320 lb. char, 15 gal. tar, 8,200 cu. ft. gas, 35 lb. solid sulfur. Char can be burned directly in standard industrial fireboxes, converted for home use, converted to coke, or used as raw material to make synthesis gas. Char heat value is 12,180 Btn. Gas heat value ranges from 600 to 900 Btu. per cu. ft. Flow diagram shows processing steps and how air and steam fluidize crushed coal and oxidizer discharge to produce a variety of products.—Chem Eng, Mar, p244

Excess Capacity, Stock Plague Textile Industry

Not since the depression 1930s has the international textile business had such rough going. The major exporting nations, Japan, England, India, and the U. S., have two kinds of trouble:

1. Long term, the textile producing nations have expanded capacity far beyond the point where domestic and foreign markets can absorb the goods.

2. Short term, the Korean outbreak caused the nations to cut loose their excess capacity, producing a sizeable glut of goods.

Individually, the textile nations shape up like this:

Japan—Production is down 40% from last year. But stocks are still piling up, and prices are sinking. The main trouble is a vast over-capacity. Japan will have to retire some of its excess capacity.

Britain — About half of all textile workers are unemployed. Others are on short time. The trouble as usual is disappearing markets. Australia, South Africa, and New Zealand have clamped on import restrictions. But the depression is not expected to be permanent.

India—Textile slump is smallest here. Most experts expect the slump to be very temporary.

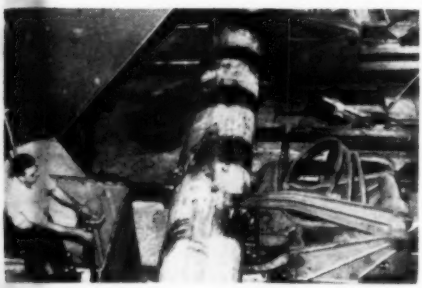
United States—The textile dip is not quite over. Layoffs and production cutbacks are still occurring. Spring orders did not come up to expectations. Most mill men are sure a rise is coming, but they expect no sizeable jump in volume. Mill activity now is less than consumer sales would warrant.—Business Wk, Apr 26, p108

TECHNICAL SHORTS

Hardening Valve Tips—Thompson Products Co. reduced hardening costs of engine valve tips by 30% with 20-kw. electronic induction heater. Other advantages of General Electric heater are consistent heating, hardness, and hardness depth.—Elec C&M, Apr, p192

Removes Sulfur—Anglo-Iranian Oil Co., Ltd.'s new catalytic desulfurization process, Autofining, removes sulfur from gasoline, naphtha, kerosene, and gas oil. Autofining, now in commercial use in South Wales, uses a fixed catalyst bed at pressures of 50 to 200 psi.—Oil & Gas J, Mar 17, p169

How To Cut Cable Cost—If your welding cables wear out too fast, try this idea. The cable wears out fastest near the electrode end, so before excessive wear takes place, disconnect both ends and reverse the cable. The worn end, now near the generator, can be further protected by slipping a piece of old rubber hose over it.—Weld Eng, May, p58



HOW TO CUT SAWING COSTS

Crown Zellerbach Co. controls huge bandsaw by electronic control of log carriage drive. D-c. drive motor is operated over speed range by armature voltage control with motor field remaining at full field excitation. Special regulator forces generator field to desired excitation and therefore desired acceleraion. Results: lower operating and maintenance costs.—Elec World, Apr 21, p160

Cuts Expansion Joint Cost—Jolt- and noise-free expansion joints were desired on the New Jersey Turnpike bridges. So engineers came up with a method for flamecutting steel plates for finger-type joints. Warping was eliminated by a special fixture. Plates were flattened after cutting.—Eng News-Rec, May 8, p67

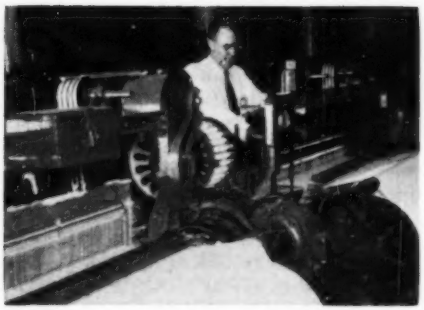
Non-metallic Permanent Magnet—New material being marketed in England by Mullard, Ltd., withstands demagnetizing fields of 2,000 to 3,000 oersteds without performance loss. One use: in small multipolar generators.—Mach, May 10, p699

Holds Tower Siding—Siding on New York City's International Airport control tower was fastened to framing by threaded studs end-welded in place. Joints between sheets were sealed with mastic. Siding went up fast.—Const Meth & Equip, May, p122

German Acrylic Fiber—"Pan," a polyacrylonitrile fiber that has exceptional firmness and durability against atmospheric influences has been developed by Cassella-Farbwerke-Mainkur, West Germany. "Pan" will be offered in both filament and staple form.—Textile World, May, p258

Meter Grades Tomatoes—Color Ratio Meter, developed at Purdue University, color-grades tomatoes, other vegetables, and fruits. Operation of the device is based on circular fluorescent light source and multiple photocell-filter combinations spaced around sample being graded.—Food Eng, May, p92

Dims Car Lights—Phototube mounted inside windshield automatically deflects headlights from high to low beam as another car approaches, then puts on the high beam after car passes. It is a factory-installed extra on new Cadillacs and Oldsmobiles.—Electronics, May, p5



GIVES BETTER LOOM PERFORMANCE

On most models of Draper cam looms, clock-spring top motions give better weaving versatility and performance. Woodside Mills found these advantages: (1) more styles of cloth can be woven than on roll tops as up to six harnesses can be used, (2) fewer warp ends are broken, (3) shed opening is clean, (4) little attention is required for harness resetting, (5) treadle roll follows cam evenly through full cycle with less tension, and (6) adjustments of tensions and harness strapping are simple. —Textile World, May, p118

Fluorocarbon-glass Tubing—Research on Teflon-impregnated fibrous glass tubing by Resistoflex Corp. has produced thin-wall tubing with Teflon's properties. Tubing can be used with virtually every known chemical.—Mod Plastics, May, p210

Improves Car Finishes—General Motors Research Laboratories developed a lacquer in which the diluent, or thinner, has a low boiling point and evaporates before sprayed lacquer hits the automobile body. Thinner eliminates tendency of finish to form "orange peels," improves surface smoothness, requires fewer coats of lacquer.—Prod Eng, May,

Seven-day Switch—Time switch is graduated into half-hours and day and night periods. Operations can be set as close as 3 hr. apart. Dial shows how heat in plant can be cut down at Saturday noon and resumed Monday morning.—Elec Whols, May, p157

Freeze-drying—Dry-Freeze Corp. and Proctor & Schwartz, Inc., teamed up to develop equipment to freeze liquid in pellet form and dry pellets, under infrared radiation wires. Freezing is done in a granulating device. Pellets then drop to belt that carries them under the wires. —Chem Eng, Apr, p240

No Moving Parts—At the Argonne National Laboratory, Magnetism powers a pump that has no moving parts. It pumps a liquid-metal coolant through an atomic reactor. Magnet, built around a specially formed piece of tubing, forces the coolant through the piping system.—Business Wk, Apr 26, p67

The Book Costs More—In May issue of McG-H Digest, p22, the price of the 1951 Black Market Yearbook was given as $1.25 in error. The correct price is $25.

Australia Makes Radar Parts—Australia is taking immediate action to start an industry to make radar for military needs. Electronic Industries, Ltd., in Melbourne will be the first Australian radar producer. It will turn out equipment for Navy ships and installations. —Aviation Wk, Apr 28, p56

Look, No Labor—Conveying and elevating system at Wightman Bottle & Glass Mfg. Co., transports, processes, stores packing-end cullet—all without a single man-hour of operating labor. Occasional maintenance is sole labor cost—Ceramic Ind, May, p64

Cut Power Costs—When selecting new power-plant engines, consider these cost-cutting ideas: (1) super-charging with exhaust-driven blowers, (2) intercooling air between turbocharger and engine cylinders, (3) using dual-fuel or spark-ignition engines.—Power, May, p92

Low-pressure Laminates—Dow Corning Corp. has developed method to make low-pressure laminates of glass cloth and silicone resin. Material is molded at 3 to 30 psi. It will withstand continuous exposure to temperatures up to 500° F. Physical and electrical properties are good.—Chem Wk, Apr 26, p36

STAINLESS-STEEL OFFICE

This 41-story office building, built for U. S. Steel Corp., strikingly combines stainless-steel window-and-spandrel assemblies in vertical columns with continuous pilasters of limestone edged with stainless-steel fins. Building's 13½-million cu. ft. of space is completely air conditioned. Power requirement is 9,000 kva. of transformer capacity. Distribution is from five 11-kv. feeders from primary network.—Elec C & M, May, p70

New Method Banishes Odors

Obnoxious odors from animal-fat and fish rendering plants can be eliminated. Method is to use a combination of chlorine and chlorine dioxide to deodorize the gases.

The foul air is drawn into the bottom of a scrubbing tower, in the base of which is a chlorine-dioxide water sump. A small pump picks up the water from the sump and carries it to spray nozzles at the top of the tower.

As the foul air rises in the tower, through a tray containing a layer of coke, it is sprayed. Another tray of coke, above the nozzles, prevents undue loss of treated water.

This system is so effective that several plants in the U. S. and Canada have either installed equipment or are planning to do so.—Food Eng, Apr, p75

Ion-Exchange Process Recovers Waste Chromate

Chromic acid in anodizing and plating baths becomes contaminated with metallic cations, thereby producing a chromate salt that (1) cannot be reused, (2) is toxic, (3) is hard to dispose.

A new installation has eliminated the problem by a cation exchanger to remove metallic cations and an anion exchanger to recover the chromate from the dilute rinse solutions. Ion-exchange resins are Permutit Co.'s synthetic resins Q and S.

Advantages of the system include installation costs half those of conventional disposal equipment, operating costs down 75%, floor space needs down 80%, material consumption down 90%, water and steam use down 85%.

Part of the anodizing bath is withdrawn each day and passed through the cation exchanger to substitute hydrogen cations for metallic cations. Effluent is returned to the bath. Exhausted resin Q is regenerated with sulfuric acid.

Resin S in the anion exchanger recovers 60 to 90% of the chromate carried over into the save-rinse tank. The anion exchanger substitutes hydroxyl ions for chromate ions. Demineralized water is returned to the save-rinse tank.—Chem Eng, Apr, p230

Skyscraper Has Glass Walls

Dust-free interior and easily cleaned exterior feature Lever Brothers new glass and stainless-steel enclosed office building

DELICATE AND TRANSPARENT, a narrow shaft of glass 24 stories high pierces the New York City skyline. It is the new home office building of Lever Brothers Co., manufacturer of soap, detergents, cosmetics, toothpaste, and oleomargarine. Built at a cost of $6-million, it will be occupied by the 1,200 employees of the company's four divisions.

In planning Lever House, the company had one primary objective—a building with 130,000 sq. ft. of office area that would be adequate for present needs and future expansion.

The building, which is completely air conditioned, contains 21 office floors, plus three floors for mechanical equipment on top. Street level contains a glass-enclosed lobby. The lobby is set back on all three street sides, leaving space for an arcade and garden. Building columns outside the lobby thus are exposed to view from the street. Hence, the structure appears to be on stilts.

Non-opening windows occupying slightly more than half of the 12-ft. 4-in. story height form a continuous strip around the building at each level. Above and below them are spandrels faced with wire glass. Backup is 4-in. solid cinder block and 2 in. of cellular-glass insulation. Sills, mullions, and heads are sheathed in 18-8 chromium-nickel stainless steel.

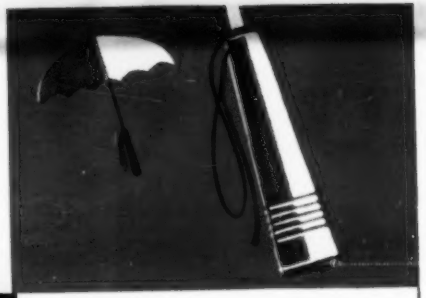
The result, the architects say, is an easily maintained durable exterior that seals airborne dirt out, keeps expensive conditioned air in. If conventional construction had been used, two to three times as much cleaning work would be needed in the offices. Air conditioning and heating costs would be higher.

To simplify and speed up washing of the building exterior, Otis Elevator Co. developed a power-operated scaffold for cleaners. They will work from a 28x2½-ft. platform capable of moving up or down at 35 fpm. Suspended and powered from a crane on the roof, the platform will run on vertical stainless-steel rails spaced 28 ft. apart. The crane runs on tracks inside the cornice.

The cleaning crew controls vertical movements with pushbuttons. Horizontal movement is accomplished by raising the platform above the cornice to detach it from the rail, then shifting it until grippers automatically find the next rail. Two men can wash Lever House and its 1,400 windows in 6 days.—Eng News-Rec, May 1, p79

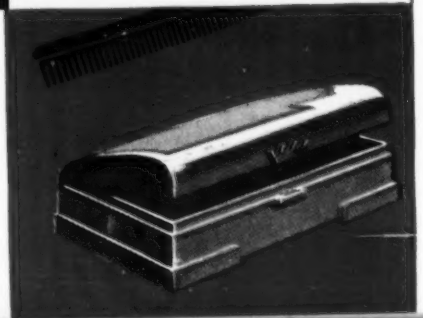
LEVER HOUSE—24 story office building in New York City—has just been completed

lightweight!
colorful!



inexpensive!

accessories can be mass-produced using



LOOK TO

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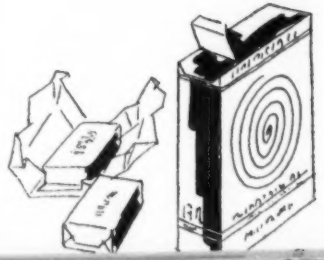
for high quality chemicals



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STYRON

a quality plastic easy to mold faster

Styron (Dow polystyrene) adds glamour to your product with a variety of attractive "built-in" colors that won't chip, peel or rust. These "built-in" colors eliminate painting and surface preparation and cut your production costs. Large area, heavy lot and intricately shaped moldings can be made quickly and cleanly with Styron. The injection molding process eliminates many assembly operations, enabling you to produce a better product at a competitive price.

Your Styron products will please the customer, too, because this attractive plastic is odorless, presents no problem of toxicity and has good strength which varies but little with ordinary temperature changes. Styron has excellent electrical properties and outstanding resistance to water. In addition, its lack of taste and odor make its applications almost unlimited.

Dow invites your inquiries regarding Styron and other quality plastics, including Ethocel (Dow ethylcellulose), saran and saran film. Please write to Dow, Dept. EX2.

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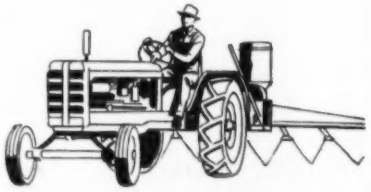
alkalies

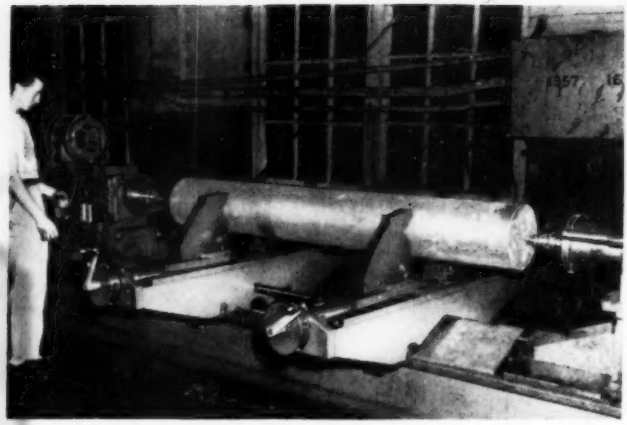
Dow alkalies serve many varied industries. Caustic soda is used to manufacture soaps, synthetic detergents and cleaning compounds; in refining vegetable oils; in manufacturing rayon and other textiles, paper and petroleum products and in chemical processing. As one of the world's major producers of caustic soda, Dow maintains uniform high quality and assures ready availability of this important chemical.



agricultural chemicals

To help farmers raise more and better crops and livestock, Dow manufactures such products as weed and grass killers, insecticides, fungicides, soil and grain fumigants, plant growth regulators, veterinary chemicals and wood preservatives. Extensive research and expanding production by Dow further agricultural progress all over the world.

Dow produces more than 600 chemicals including industrial and agricultural chemicals . . . fine chemicals for the pharmaceutical industry . . . chemicals basic to progress and industry.



CENTERING LATHE

An old lathe at Marion Power Shovel Co. was modified to center and drill relief in ends of rough shafts by adding two special carriages and two heads made by Ex-Cell-O Corp. Work capacity is 20 ft. long, 20 in. in dia. Clamping is manual, but carriage travel and cutting are powered.—Am Mach, Apr 14, p133

New Magnetic-Tape Method Compares to Sound on Film

Boundary-displacement magnetic recording, recently developed by Engineering Research Associates, Inc., uses an ordinary magnetic tape magnetized to saturation. With no modulation on the tape, one half the tape has one polarity and the other half the opposite polarity. An unmagnetized boundary strip runs down the middle of the tape.

A conventional magnetic-tape pickup head is used for playback. With no signal on the tape, the equal-width opposite-polarity fields cancel in the pickup; result is no output signal.

With modulation on the tape, the unmagnetized boundary weaves back and forth, according to the signal waveform. Net flux acting on the pickup head varies correspondingly as sidewise movement of the boundary changes widths of magnetized regions.

Characteristics of the system include:

1. High degree of amplitude linearity independent of the magnetization remanence curve of the medium.
2. Maximum signal output corresponding to full-tape saturation.
3. Zero-signal noise output comparable to that produced by d-c. saturation wipe of the tape.
4. Performance not critically dependent on bias level.
5. Simple processing of recording to yield an oscillographic display of the recording signal. — Electronics, Apr, p116

Product-Design Shorts

▶ **Heat sealers** on machines that assemble cardboard containers must be slippery at heated areas to prevent binding between carton and heater. So Package Machinery Co. sprays Teflon on the heater surfaces.

▶ **Zinc coating** is applied to aluminum by dipping in a solution of water-soluble zinc sulfate and hydrofluoric acid. Philadelphia Rust-Proof Co. owns the patent.

▶ **Oil mist precipitator,** made by Trion, Inc., saves lubricants in high-speed cutting and grinding operations. Mist is charged as it passes through an electrostatic field and is attracted to plates of opposite polarity. It then drains to a collecting pan for reuse.—Prod Eng, Apr, p5

Large Generator Units Need Motor-Driven Exciters

Direct-connected exciters are not practical on generating units of 80 Mw. or larger; the combination shafts required for units of this size are too long.

Duquesne Light Co.'s solution to this problem is to use a flywheel-type, motor-driven exciter. It is designed to provide excitation equivalent of a direct-connected exciter during all system disturbances that do not cause instability. General requirements are:

1. Induction motors should be used in preference to synchronous motors, which are more affected by system faults.

2. Exciter set should be able to deliver maximum forcing excitation to generator field when motor voltage is 70% of normal for ½ sec.

3. Transfer characteristics of set should prevent needless transfers for short system disturbances. If voltage should remain below 70% for too long, an automatic transfer to auxiliary power should be made to prevent loss of excitation.

Duquesne's Elrama Station meets requirements by having two auxiliary power sources—a direct-connected station generator and a step-down transformer connected to the 69-kv. system. —Elec World, May 5, p98

Germans Set Span Record

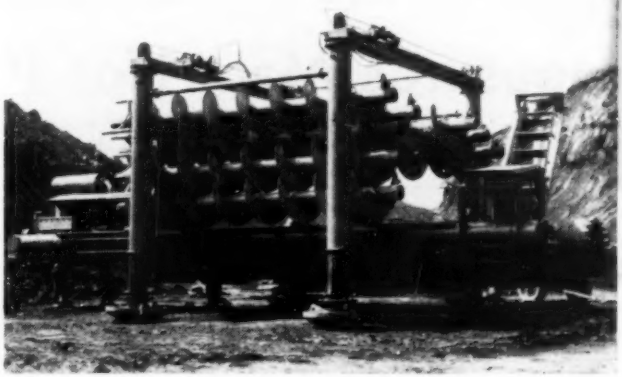
German engineers, using a welded hollow-box design, have set a new plate-girder span record of 676 ft. The span is part of the 2,500-ft.-long Dusseldorf-Neuss bridge across the Rhine River.

The girder system consists of a pair of continuous boxes 25 ft. wide, spaced 20 ft. apart by 11 diaphragms in the three span layout. Roadways are carried directly on the box girders while two street-car tracks are installed over the central open space, resting on a series of floorbeams and stringers. The top steel plates of the boxes are corrugated to provide effective bond for an asphalt wearing surface.

Structural sections stiffen top and bottom plates as well as the webs. Enough stiffening is employed so that the girders can be figured as trusses with the stiffeners as the compression members and the web as the tension diagonals.—Eng News-Rec, May 1, p51

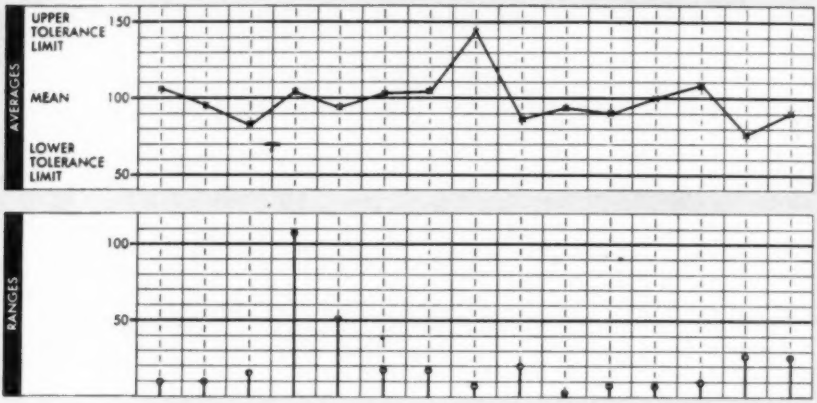
NEW 42-IN. COAL AUGER

New model coal auger built by Grafton Coal Co. permits high-wall drilling of 28- to 48-in. diameter holes to produce 50 to 100 tons per hour. Auger sections have an effective drilling length of 21 ft. A 225-hp. Cummins diesel with a fluid coupling powers the operating carriage.—Coal Age, Apr, p114



OPERATOR WHITMAN — DEPARTMENT TURNING

MACHINE J & L 3 - #116 — INSPECTOR R. C.



PART NUMBER		N 20434	"	R-805	CP-1684	CP-1689	"	N 22212	111437	"	"	"	111456	"	"	"
DIMENSION		4.370 ± .005	4.370 ± .005	.500 ± 1/64	3.9345 ± .0006	.4975 ± .0025	.9375 ± 1/64	3.250 ± 1/64	.8672 ± .0078	.375 ± 1/64	2.200 ± 1/64	1.625 ± 1/64	2.125 ± 1/64	1.625 ± 1/64	1.000 ± 1/64	.500 ± 1/64
CONTROL UNITS	1	105	95	81	100	120	97	116	138	74	94	90	98	106	86	72
	2	105	95	78	100	110	97	103	142	94	94	87	97	108	82	92
	3	110	105	74	142	70	95	105	142	94	94	95	105	116	81	92
	4	100	100	90	142	90	105	100	145	90	95	89	100	108	78	97½
	5	105	95	84	33	80	113	97	145	94	95	87	100	108	58	98
TOTAL		525	490	407	517	470	507	521	712	446	472	448	500	546	385	451
AVERAGE		105	98	81	103	94	101	104	142	89	94	90	100	109	77	90
RANGE		10	10	16	109	50	18	19	7	20	1	8	7	10	28	26
DATE		6-25		6-29		6-27			7-2							

***SHOP ANALYSIS CHART** forms part of a new variation in statistical quality control that . . .*

Measures Man, Not Product

Some form of quality control is desirable. When small-lot operation limits use of product quality control, try operator control

STATISTICAL QUALITY CONTROL has established itself as the best way to build desired quality with minimum rejections into a product. But sampling small lots—the production pattern of a job shop—is impractical. Package Machinery Co. makes equipment in a small-lot, job-shop operation. So it tried a new approach to apply the principles of quality control to its production.

The company inspects the first piece on each operation. This shift in quality-control procedures was made: **The**

quality of each operator is measured and controlled instead of the quality of a production lot. Standard sample consists of five measurements on the work being done by the operator at the time.

The charting procedure is based on an arbitrary scale. Variations from mean dimensions are converted to control units by a simple calculation. Conversion to control units makes all measurements comparable.

This method is used to calculate control units:

If the actual dimension is *greater* than the mean dimension specified: (1) subtract the mean dimension from the actual, (2) divide the difference by mean tolerance and multiply by 50, (3) add this number to 100 to get control units.

If the actual dimension is *less* than the mean dimension specified: (1) subtract the actual from the mean dimension, (2) divide the difference by the mean tolerance and multiply by 50, (3) subtract this number from 100 to get control units.

Allowable variation is from 50 to 150 control units. Beyond that the operator's quality is considered out of control.

There is a chart (see opposite page) for each operator. On it the inspector posts the results of each check.

The bottom block on the chart shows part number; dimension or dimensions checked, including the tolerance; each of the five measurements converted to control units. Also, the inspector enters the calculated average of the five control units, and the range—the difference between the high and low control units.

In the top block the inspector charts the averages of the five control units. A glance tells whether the operator is within tolerance limits.

The middle block pictures the range. Both control units and ranges are watched. It is possible for the control units to look good when range is bad.

Before the quality-control program went into effect, responsibility for quality was transferred from final assembly to a chief inspector. Then an intensive educational program for supervisors and operators was conducted.

To get the program going, and to build some historical data, the inspectors checked a minimum of 5 pieces, or 10% of each lot.

A continuous record of the quality performance of each operator was kept. Some were found consistently better than others. For the purpose of specifying how often an inspector should check an operator, the following table was developed.

OPERATOR CLASS	LIMITS CONTROL	RANGE	SAMPLE WORK
1	Between 80 and 120 CU's	Less than 35 CU's	Every 2 hours
2	Between 70 and 130 CU's	Less than 50 CU's	Every hour
3	Between 60 and 140 CU's	Less than 50 CU's	Every ½-hour
4	Outside of Class 3. This class is unsatisfactory. Operator must improve or be replaced.		Every ¼-hour

The frequency of checking an operator's work depends on the result of the last check. An operator usually stays within a class over a long period of time, depending on his skill, experience, and performance. If he drops back, he usually does not stay back long. In the long run, he generally shows gradual improvement.

Other benefits obtained from the program were:

- Repairs by final assemblers were eliminated.
- Machine tools were transferred from repair work in final assembly to productive use.
- Final-assemblers' required skill was lowered.
- Production delays were reduced.
- Productivity went up 8%.
- Rejection scrap was cut 11%.
- The interest of the operators in quality workmanship was stimulated.—Factory, May, p128

Heavy Machines Scoop Up Bauxite at Mine . . .

Bauxite is coming to the U. S. from Jamaica, British West Indies. Reynolds Metals Co. expects to ship 750,000 tons this year from its $17½-million development on the north coast, 55 miles from Kingston. Bauxite is only a few inches under the top soil, which is replaced when mine is worked out. Ore, after it is screened and dried, is moved 6 miles to shipping pier by ropeways. Nodulized bauxite goes to silos, then

High-Pressure Water Aids Maintenance Cleaning

High-pressure water does a lot of maintenance jobs in the Shell Oil Co.'s refining operations. Portable pumping equipment has brought it to all areas of the refinery for maintenance cleaning. Here are some of the jobs that the water does:

A Worthington descaling nozzle is used to remove scale from the outside of tubulars, such as on overhead condensers and lube-oil coolers. A straight nozzle cleans interior and exterior of small tubes when scale deposits are hard.

A Hydro-Silica gun nozzle does a good job in pipe cleaning. This nozzle is fitted with an aspirating connection by which air carrying sand is mixed with the water when hard-water or hydrocarbon scales are to be removed.

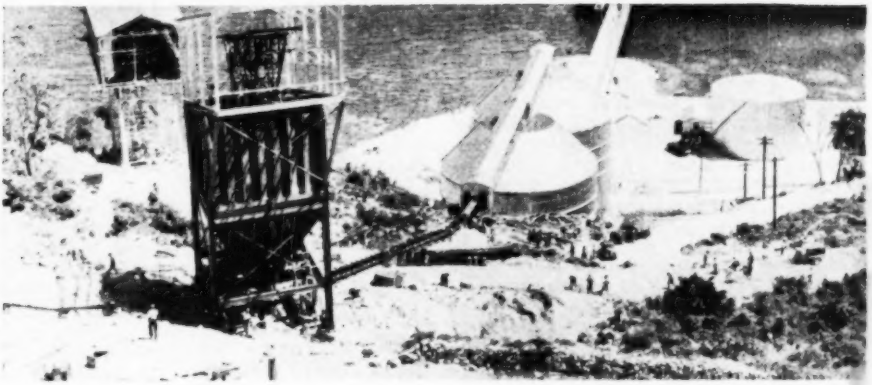
Two types of boring nozzles are employed for underground boring in the installation of casings under roads, railroads, railroad tracks, firewalls. One type has several streams of water directed ahead to enter the soil while others directed to the rear wash cuttings out of the pipe. The second type is pushed forward by hydraulic jacks while backward jets wash out the cuttings.—Oil & Gas J, Apr 21, p133

Chose Right Tractor Shoe

If crawler tractor shoes are so wide that tracks do not slip under overloads, the gears take a beating. On turns, a too-wide shoe increases twisting stress against pins and bushings, builds up greater leverage loads on roller flanges, reduces tractor power, and increases wear on track-laying mechanism.

On rough or rocky ground, a very wide shoe may span between humps and be bent by the load of the moving tractor. Shoes sometimes are so wide

. . . Ropeway and Conveyor Deliver It to Ships



by conveyor to pier and a moving loader that drops it into ships at rate of 1,400 tons per hr. Ships carry bauxite 1,000 miles to U. S. gulf ports. Total reserves are 300-million tons of low-silica bauxite running 50% alumina. Reynolds, besides taking bauxite out of Jamaica, is doing pilot dairy and farm experimentation to improve agricultural techniques for Jamaican use.—Iron Age, Apr 10, p73

that grousers do not sink to their full depth, decreasing effective grouser area and thereby increasing rolling resistance and track wear.

Shoe size should be adopted to job conditions. Only where flotation is required, should large shoes be used. Most jobs are done better with recommended-width track shoes.—Const Meth & Equip, May, p59

Plastic Carboys Safe

Just announced are one-piece lightweight, unbreakable carboys. Plax Corp. makes them of polyethylene in 6½- and 13-gal. sizes.

The plastic carboy will lower shipping cost by as much as 20% and shipping of empties by 60%. The 13-gal. polyethylene-plywood carboy weighs 29 lb., compared with 70 lb. for a 13-gal. glass-wood carboy.

Second decided advantage is safety, especially in handling dangerous chemicals. The carboy is also resistant to corrosion, permitting them to be reused for shipping most acids and corrosive materials—Chem Wk, Apr 12, p57

Electrical Shorts

▶ Degreasing sheet-metal parts before painting and drying in a conveyor-type 85-kw. infrared oven saved Radiant Steel Products Co. over $300 a month. All operations are done at the same time on the same conveyor belt.

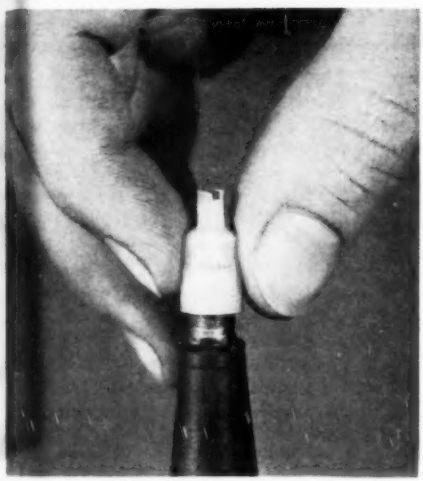
▶ Sauerkraut is protected during aging by 18-watt ultraviolet lamps at P. Herold & Sons. Lamps prevent the mold and pink hue that would reduce quality and saleability.

▶ Strip heaters at H. H. Robertson Co. melts wax safely and accurately. The 126-kw. heaters are clamped to outside of 600-gal. kettle. Other heaters on valves assure easy flow of wax into containers.—Elec World, May 5, p137

NEW EQUIPMENT...

Electronic Duplicator — Single-motion duplicator saves time in turning shafts, bearings, pulley sheaves, and similar parts of irregular contour. It consists of transducer-type follower, electronic control unit, and output drive motor that positions follower and cutting tool to reproduce contour of templet.—**Raytheon Mfg. Co.**—Am Mach, Apr 14, p199

Hydraulic Pumping Jack—Long-stroke unit is automatically controlled to have pumping periods occur at predetermined intervals without attention from operator. Cylinder of model 350-7-10 D-P is 1 in. in dia., rod load is 20,000 lb., stroke is 10 ft. Other models have strokes of 20, 25 and 30 ft.—**Pelton Water Wheel Co.**—Oil & Gas J, Apr 28, p123



NYLON TIRE-VALVE CAPS

Tire-valve caps molded of nylon afford positive air-tight seal, will not break or chip, will not rust or corrode, and are unaffected by exposure to weather. Threads will withstand the wear of repeated removal and replacing. Dill Mfg. Co. makes the caps.—Mod Plastics, May, p98

True Daylight—Lighting unit, Spectro-Lite, uses colored fluorescent tubes to produce light effect equivalent to true daylight. It blends primary colors of spectrum to make white light.—**John P. Filbert Co., Inc.**—Elec World, Mar 24, p170

Sticks Aluminum — Adhesive strong enough to make lap joints of aluminum alloys contains Araldite resins of ethoxylene oxide, with acid anhydrides, amines, or other compounds as hardeners.—**Ciba Co., Inc.**—Chem Wk, Apr 5, p65

Controls Engine Speed—New governor gives instant variable speed selection and correct engine control at any speed setting within 1,200 to 2,600 rpm. Uses: industrial and farm engines, corn shellers, drag lines, hoists, trucks, and tractors with power take-offs.—**Pierce Governor Co.**—Prod Eng, May, p260

Handles Many Jobs—Small tractor conveyor carries mortar, bricks, cement, wet concrete. Rate of movement for wet concrete is 1 to 3 cu. yd. per min. Concrete does not segregate.—**American Conveyor Co.**—Const Meth & Equip, May, p157

Dispenses Sensitized Paper—Pressure on a lever delivers a single sheet of sensitized paper from light-tight dispenser. Two sizes are available—one for 8½ x 11-in. paper; the other for 8½ x 14-in. paper.—**Remington Rand Inc.**—Marine Eng, May, p122

V Packing — Continuous chevron-type packing design for 500 to 600 psi. is available for either high or low temperatures. User of Continuous-Vee packing cuts his own rings to fit the job.—**Flexrock Co.**—Iron Age, Mar 27, p126

Small Hydraulic Ram—Weighing 23 lb. and measuring 6¾ in. high, 7½ in. wide and 3 in. thick, new ram has push of 30 tons. Ram works in any position and is fully adjustable.—**Borg-Warner Int'l Corp.**—Am Auto, June, p134

. . . AND MATERIALS

Detects Fire — Temperature-rate-of-rise, not fixed temperature, actuates new fire detector. Circuit tubing may be installed in refrigerated areas or in high-temperature process areas. System can sound local alarm and transmit the warning to a central station.—**Walter Kidde & Co.**—Eng News-Rec, May 8, p141

Improves Abrasion Resistance—Aquex aids abrasion resistance and reduces shrinkage of synthetic fabrics. Product is a soft, pliable resin whose plasticizing effect reduces damage of needle cutting or burning.—**Aquex Development & Sales Corp.**—Textile World, May, p152

Metal-clad Laminates—Laminated phenolic is offered as copper-clad or aluminum-clad sheets. They can be printed and etched for printed electrical circuits. Available sizes are 36x42 in. in thicknesses of 1/32 to 3/32 in. Metal-foil thickness is 1½ to 3 mils.—**Richardson Co.**—Electronics, Apr, p272

Slurry Pump—New pump transfers materials considered until now impossible to pump. Hydrex pump has two pistons actuated by hydraulic fluid pumped from cylinder to cylinder by a high-pressure pump. Alternating piston movement pumps slurry or other thick liquid.—**Manton-Gaulin Mfg. Co.**—Paper Ind, Apr, p117

Portable Welder, Power Tool—Porto-Weld presents a compact combination of a welder and a power drive for hand tools. It is a handy kit for small welding and brazing jobs, as well as for grinding, buffing, and sawing.—**Generator Sales Co.**—Factory, May, p170

Longer Battery Life—Making positive plate of Silvium metal lengthens battery life. Plate consists of core rods inserted in slotted rubber tubes; active material is packed in tubes around the rods. Slots in tubes permit electrolyte to enter. Bottom base is polyethylene.—**Electric Storage Battery Co.**—Power, May, p168

MIX-YOUR-OWN FACE POWDER

Transparent and opaque acetate are combined in the Peri Powder Palette—a container holding six different shades of face powder and including a blending box, measuring scoops, and an empty compartment for storing blended powder. Each shade of powder is in its own clear sift-proof acetate container, with a tight-fitting lid that retains the freshness and fragrance of the powder.—Mod Packaging, Apr, p104

High-speed Forging—Improved line of forging presses, available in 300 to 4,000 tons, features air friction clutch; air-release, spring-set brake; buffer cylinder installed in crown to help the brake stop the heavy slide at top of stroke. Welded frame has main stress members on either side of die seat and extending from bottom of bed to top of crown.—**E. W. Bliss Co.**—Iron Age, May 1, p159

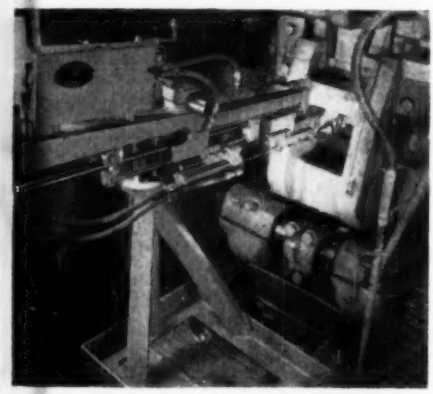
Cools Diamond Drills—Adapter permits diamond drills to be used in any portable or stationary electric drill having a standard chuck. It can be attached to any water source.—**Wheel Trueing Tool Co.**—Business Wk, Apr 26, p68

NEW EQUIPMENT (Cont.)

Fluorescent Mercury Lamp—The 1,000-w. lamp gives golden white light for all types of service except where close color discrimination is involved. Inside frosting diffuses light, provides uniform color. —**Westinghouse Electric Corp.** — Elec World, May 5, p144

Collects Dust—Traveling device across open end of filter bags in Dynaclone dust collector reverses airflow in one bag at a time. Constant cleaning assures uniform suction at dust sources, eliminates bag shaking for longer service.—**W. W. Sly Mfg. Co.**—Eng & Min J, May, p117

Polystyrene Polish—Floor polish, called Lastic Gloss, is said to contain polystyrene, which polymerizes on floor to give glossy but nonskid properties.—**Magicolor Co.**—Chem Wk, May 3, p47



PORTABLE PRESS UNLOADER

A portable unloader for removing small parts from automatic presses has been developed by Sahline Engineering Co. It is useful where it is impractical to eject parts mechanically, through a bed opening, or by gravity. It works like this: When the automatic press has completed its forming or shearing operation, unloader's steel jaw moves into die. It grips stamping, lifts it out of die, and drops it in tote box. It then returns for next cycle.—Business Wk, May 10, p58

Clinching Nail—Self-clinching nail will fasten asbestos or wood shingles to nonwood sheathing. Radial action at the point clinches the nail tight as its head is fully compressed against the shingle.—**E. G. Building Fasteners Corp.**—Am Builder, May, p148

Counts Miles — New hub-cap mileage counter for commercial vehicles and trailers is completely sealed against tampering, as well as dirt, moisture, and grease. This hubodometer remains in proper reading position, regardless of wheel position.—**Knopf Instrument Co.** —Fleet Owner, May, p147

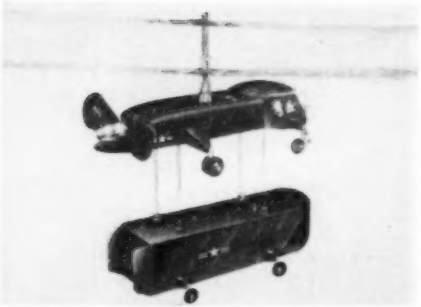
Microwave Relay—Industrial radio communications system handles 24 voice circuits, 400 teletype or telemetering operations, nearly 1,000 remote supervisory control functions. Equipment features double frequency modulation subcarrier-type multiplexing.—**Motorola, Inc.**—Oil & Gas J, May 12, p196

Injection Molding Machine—New automatic 6-oz. preplasticizing machine makes a complete cycle in 9 sec. It is designed for semiautomatic or completely automatic operation on all thermoplastics. One operator can handle five machines.—**Jackson & Church Co.**—Mod Plastics, May, p144

Tough O-rings—Special O-rings provide positive metal-to-metal static sealing wherever problems of heat, pressure, corrosive liquids, or gases are involved. Seals are hollow tubes filled with inert gas at 600 lb. per sq. in.—**United Aircraft Products, Inc.**—Aviation Wk, Apr 21, p67

Squaring Shear—Air-powered squaring shear requires air pressures of 70 or 80 lb. per sq. in. Adjustable ways are made of laminated plastic. Quick adjusting back gage is standard equipment.—**Niagara Machine & Tool Works**—Auto Ind, May 1, p62

Germicidal Lamp—New fixture, which takes slimline germicidal lamps, is exposion-proof. It consists of Vycor glass tube that houses lamp.—**Crouse-Hinds Co.**—Elec World, Apr 21, p176



DETACHABLE POD HELICOPTER

Possible applications of Gyrodyne Co. of America's experimental coaxial rotor helicopter include this cargo version. Cargo is carried in detachable pod. Unloading and loading can take place while craft hovers. Coaxial rotor eliminates anti-torque rotor; saves power.—Aviation Wk, Apr 28, p25

Aluminum-coated Glove—Asbestos glove is lined with aluminum to reflect radiant heat away from worker's hands. The aluminum-coated fabric is placed between two asbestos layers; glove is jersey lined inside.—**Milburn Co.**—Chem Eng, Mar, p192

Air-powered Nut Runner—Model MA-25 power torque tool gives exact torque control in the 0 to 25 in.-lb. range. Torque is set with built-in torque wrench as a gage. When predetermined torque is reached, tool stops automatically.—**Garvin Bros., Inc.**—Prod Eng, May, p242

For Knit-goods Dyeing—Dyer withstands high temperatures necessary in dyeing Orlon, nylon, and Dacron knitted goods. Temperature range is 212 to 300°F. Models with capacities of 50, 100, and 200 lb. are available.—**Gaston County Dyeing Machine Co.**—Textile World, May, p139

Protective Coating—Modified thermosetting phenolic resin protects structural and mechanical equipment against corrosion. It may be applied by brush, spray or trowel on steel, glass, wood or concrete. —**Carboline Co.**—Coal Age, Apr, p124

Detects Water Leaks—Ultraviolet lamp helps locate leaks in engine cooling system. Fluorescing powder is added to coolant and circulated. Passing ultraviolet light beam over system causes leaks to show up in a bright color.—**Allan Electric & Equipment Co.**—Bus Trans, May, p114

Glues Siliconed Surfaces—Glas-Weld successfully adheres silicone-coated paper, wood, ceramics, and metals and handles well in high-speed gluing machines. Product fills a special need in pharmaceutical packaging field.—**Polymer Industries, Inc.**—Mod Packaging, Apr, p140

Adjustable Blowtorch—Pistol-grip handle can be moved close to new torch for better control, or back away from the reflected heat. It is designed for industrial field and burns standard liquid petroleum gas.—**Industrial Engineered Products Co.**—Business Wk, May 3, p66

Pump-motor Combination—Unit can be used either as a hydraulic pump or fluid motor. It is a 2,000-lb.-per-sq.-in. vane-type pump that can be changed to motor operation without internal changes. Clockwise or counter-clockwise operation is had by changing the position of the pumping cartridge.—**Denison Engrg. Co.** —Factory, May, p154

Enamels for Aluminum—Vitreous enamel finishes for aluminum are available in wide range of colors. They can be applied using ordinary enameling and firing procedures. Slips are based on formulations offered without charge.— **E. I. du Pont de Nemours & Co., Inc.**— Ceramic Ind, May, p102

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish without any charge additional information about any new product or technical development described. Address your letter to: The Editor, McGraw-Hill Digest, 330 West 42nd St., New York 36, N. Y., U. S. A.

PRESIDENT'S OFFICE in Toledo, Peoria & Western Railroad's building features custom-built functional desk.

SPECIAL DESK has more than 35 drawers, files, and conveniences. Office belongs to Meat Cutters & Butcher Workmen union.

UNUSUAL ARRANGEMENT at Grant Wilson, Inc., allows secretary to see when officer should not be disturbed.

LARGE CONFERENCES can be held at this desk by lowering paper and utility rack. Office has television set.

New Ideas In Offices

Top executive offices are designed to make a good impression and to fit particular needs of executives. Desks and other furnishings are often as individual as the executives themselves. But the emphasis is always on convenience and plenty of room and light.

For example, the president of a railroad would need a functional unit (above left). The desk, designed by George Nelson, was built by Herman Miller Furniture Co. Functional too is the word for the president's office (center left). Executive desk is a Stow & Davis model.

Prestige and large conferences keynote union-headquarter offices (above right and lower left). Both desks are custom-built units. They have racks, drawers, and even buttons to control television sets. Such functional conveniences can be designed into custom-built equipment.—Am Business, Apr, p14

Tube Reads Information from Electronic Impulses

New electronic tube, developed by Consolidated Vultee Aircraft Corp., changes electronic impulses into visual information. The information can be viewed on a screen or reproduced for permanent record on ordinary paper.

The tube is called the Charactron. It has a matrix, containing character-shaped openings, located between an electron gun and a fluorescent screen at the viewing end of the tube. Electrons passing through the openings form a shaped beam that produce characters on the screen.

One big use for the tube will be the reproduction of information supplied by high-speed computers. Another use will be to make performance studies over periods of time ranging from a fraction of a second to many minutes. Such studies might include vibration analysis, determination of servo-system parameters, wind-tunnel tests, and conversion of telemetering data.—Prod Eng, Apr, p203

Low-Cost Fire Protection

Allied Chemical & Dye Corp. wanted fire protection for its new chlorination and distillation buildings, where it pumps and processes highly flammable benzene and derivatives. The system had to fit into existing buildings with a minimum of expenditure.

To do the job, the company chose Air Foam—a new automatic sprinkler, water spray, and fire foam system. It was designed and installed by National Foam Systems, Inc. Allied gets:

- Rapid extinguishing of fires with protection against flashback.
- Three-dimensional fire protection.
- Low first cost because of low water requirements.

The system automatically (1) detects

Convention Calendar

(Equipment Exhibited)

Sept. 5-14 — Washington Far East Trade Fair, Seattle, Wash.

Sept. 8-12—Seventh National Instrument Conference and Exhibit, Cleveland, Ohio.

Sept. 9-13—Seventh National Chemical Exposition, Chicago, Ill.

Sept. 22-25—American Mining Congress Mineral Mining Convention and Exposition, Denver, Colo.

Oct. 6-10—National Hardware Show, New York, N. Y.

Oct. 6-11—Seventeenth Southern Textile Exposition, Greenville, S. C.

Act. 18-24—National Metal Congress and Exposition, Philadelphia, Pa.

Oct. 20-24—National Safety Council Exposition, Chicago, Ill.

Oct. 20-25—National Business Show, New York, N. Y.

Nov. 6-8 — American Association of Textile Chemists and Colorists, Boston, Mass.

Nov. 30-Dec. 5—Exposition of Power & Mechanical Engineering, New York, N. Y.

Jan. 25-28—National Sporting Goods Show and Convention, New York, N. Y.

Feb. 25-28—National Vehicle Show and Fleet Maintenance Exposition, New York, N. Y.

If you are interested in any of these expositions, either as a possible equipment exhibitor or as a visitor, the McGraw-Hill Digest will be glad to furnish additional information.

a fire, (2) releases the water supply, (3) mixes the water with a foam stabilizer and (4) discharges the mixture through aerating sprinkler heads.—Factory, May, p135

Raises Tenter Production

A new machine for framing and tentering cotton fabrics increased production for Textileather Corp. The machine applies finishes, dries fabrics under tension, gives the fabric a smooth surface, and removes wrinkles.

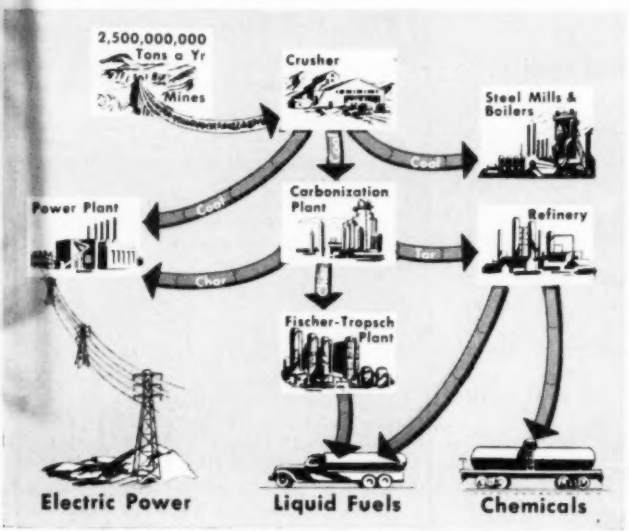
First the desired finish is applied. While on the tenter frame, the cloth passes through a series of three ovens where it is dried to shape. Distances between the two sides can be adjusted to the width of the cloth and can be varied so that the cloth can be stretched to any desired width while drying.

Final stage is a winding device that winds the cloth into rolls and controls the lengthwise tension. Cotton fabric runs through the machine at 120 yd. per min.—Textile World, May, p250

Fifty Years From Now—How Coal Industry Looks

By the end of this century, the coal industry might present a picture like this:

1. Coal is mined at low cost with clever machines in terrific volume.
2. The coal is then crushed.
3. The fine coal is processed continuously in some sort of low-temperature carbonization equipment, with or without an atmosphere of hydrogen.
4. The tar from the operation is worked up to liquid fuels and a minor quantity of needed chemicals. The liquid fuels are transported by pipe line to suitable points for retail distribution.
5. The char from the operation is transported by pipe line to suitable points for electric-power generation.
6. Over-production of char is converted to liquid fuel by a modification of the Fischer-Tropsch process.—Coal Age, Apr, p70



***THE FUTURE** of coal as may be determined by energy consumers, technologic developments, fuel reserves is shown*

The Facts About Germanium

Discovery of the transistor, the tiny chunk of metal that may replace the vacuum tube, focuses attention on germanium and its possibilities

YOU HAVE READ in the McG-H Digest about new electronic uses for germanium (Sept '48, p34; Oct '51, p52; Feb '52, p50). But what are the possibilities for expanded use of this strange-acting semiconductor in transistors and rectifiers?

Last year, germanium output was between 5,000 and 6,000 lb., according to Dr. R. Brown of Bell Telephone Laboratories. And the future? Perhaps 15,000 to 20,000 lb. a year by 1955—maybe more. Some estimates run as high as 40,000 lb. by 1956.

Germanium is far from abundant; future demand may outstrip supply. It occurs in traces in many ores and minerals, especially sulfide ores of silver, lead, tin, antimony, and zinc. But few minerals contain more than a few thousandths of 1%.

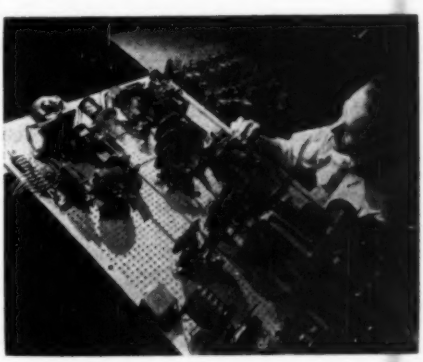
In Great Britain, General Electric Co., Ltd., teamed up with Johnson, Matthey & Co., Ltd.. to locate flue dusts containing germanium in recoverable quantities and to develop a method to recover the germanium. The recovery process is now ready for full-scale production. It is based on smelting the dust with suitable fluxes, followed by conversion into chlorides, distillation of germanium tetrachloride from solution, fractionation, and finally rectification.

In the U. S., germanium is produced by Eagle-Pitcher Co. from germanium-rich zinc ores. Roasting ore concentrate converts sulfides to oxides. Coal and salt are added to the crude zinc oxide and sintered to convert oxides to chlorides of germanium, cadmium, and gallium.

Germanium and cadmium chlorides volatilize and are collected for further processing. The main recovery step is distillation of the germanium tetrachloride from strong hydrochloric acid solution. This step removes most of the arsenic. The rest is removed by reducing arsenic to its metallic state by reacting with copper turnings.

Purified germanium tetrachloride is distilled from the copper and hydrolyzed in ice water to obtain germanium dioxide. It is the pure white dioxide powder that Eagle-Picher usually ships to electronics manufacturers, who reduce it to the metal at their plants.

The dioxide is packed into graphite boats and heated in an electric furnace in a current of hydrogen at 600° to 650° C. until no more water evolves. The



MAKING A ROUGH MODEL SMOOTH

Manufacturers often put together rough models of a newly designed control or instrument. But engineers of Lewis Flight Propulsion Laboratory have given their haywire models some polish—and saved time—with this make-up board. Parts are fastened at any angle to the board. That way, engineers can get dimensions for final design.—Business Wk, Apr 12, p152

hydrogen is then replaced by nitrogen and the temperature is raised to 1000° C. to melt the germanium powder into ingot form.

How much does this unusual metal cost? Plenty. The price right now is $340 a lb. The dioxide goes for $142 a lb. As more companies begin producing the metal and the dioxide, prices are likely to slip.

Price is no obstacle to its use in transistors, which require only a tiny piece weighing about 0.005g. Most germanium will go into power rectifiers. —Chem Eng, Apr, p158

Seaweed Extractives Find Versatile Uses in Food

Refined hydrocolloids, now being made from seaweed, are suitable for gelling, binding, bodying, thickening, suspending, stabilizing and precipitating purposes. Essentially, they are mixed salts of a polysaccharide built primarily of galactose units.

Uses include that of refined Irish-moss extractives as stabilizers for chocolate milk drinks. They keep cocoa fibers from setting, prevent fat from rising, and give a desirable body to the drinks.

In brewing beer, 3 to 4 lb. of unbleached Irish-moss, blended to uniform strength, is added to 100 bbl. of wort as soon as boiling starts in the kettle. Colloid from the moss reacts with proteins to give a fast, hot break.

Irish-moss extractives simplify preparation of French dressing. Hydrocolloid is added at concentration of 1¼% of water and vinegar. Result is stable product with excellent fluidity characteristics.

Moss extractives serve also as carriers for antioxidants to protect frozen fish from rancidity and as stabilizers for cake icings and fruit pies.—Food Eng, May, p114

How To Electropolish Stainless Steels

Electrolytic polishing of stainless steels gives it a chemically clean surface free from superficial stress. The work serves as the anode, while both cathode and electrolyte vary with material being polished and the polishing method selected.

The actual polishing resembles electroplating, but current is reversed. From 0.0002 to 0.001 in. of metal is removed from the work, thereby polishing its surface. Current density is 0.5 and 1.5 amp. per sq. in. of surface metal at 6 to 8 volts. The electrolyte is usually heated.

Solutions most widely used are based on phosphoric acid, sulfuric acid, or both in combination, together with inhibiting agents such as chromic acid, tartaric acid, glycerol acid, and benzene. One phosphoric acid electrolyte is a 90% solution with more glycerine than acid. A satisfactory sulfuric acid electrolyte consists of 20% sulfuric acid, and 50% citric acid. The balance of the electrolyte is water.

An electrolyte available commercially is 55 to 60% citric acid, 15 to 20% sulfuric acid, and 20 to 30% water. It was developed for commercial use by Rustless Iron & Steel Corp.—Am Mach, May 12, p140

Coming Next Month . . .

. . . will be another of the Digest's original stories on how American companies operate their overseas businesses. You have told us you want more of these stories. So next month, we'll tell you how Burroughs Adding Machine Co. carries on its foreign affairs—how Burroughs, for instance, lopped off part of itself and grafted it into the economy of Scotland.

EXCELLENT ILLUMINATION in this plant points up how top management now realizes that . . .

New Lighting Standards Aid Industrial Production

Report to Management

- **Higher illumination levels with reduced brightness contrasts promote easier seeing with greater visual comfort**
- **Better-quality lighting improves production efficiency, reduces unit costs, creates better employee morale**
- **Higher-reflectance finishes in plant interiors, increase lighting efficiency, improve the visual environment**
- **Improved reflector designs and wide range of light sources and systems make it easy to plan specific lighting results**

REVOLUTIONARY CHANGES in industrial lighting are in the making. The changes are to better quality lighting and higher lighting levels, made possible through improved lighting-equipment designs and the creation of a better visual environment throughout all work areas. Experience has proved that such changes are economically justified. They result in increased production, better workmanship, fewer accidents, less eye strain, reduced worker fatigue, happier employees, and lower unit costs.

The next 11 pages tell you how—➤

Improved Visual Environment

LIGHTING SPECIALISTS for many years have been stressing the need for a better visual environment wherever artificial lighting is installed. They have known that lighter ceilings, sidewalls, and floors would improve seeing conditions in industrial plants.

But few engineers have had the courage to recommend such treatment for production areas as most such areas have traditionally been low-cost, unfinished structural areas with open joist work, sawtooth roofs, brick and concrete walls.

Industrial management itself is greatly responsible for the current trend to lighter interiors and the resulting better visual environment. It has recognized that since labor costs have risen sharply, workers must see quickly and distinctly if maximum production per man-hour is to be realized. As a result, hundreds of plants have already modernized their lighting and have included interior painting as part of the modernization.

How To Improve Environment

An improved visual environment in industrial areas can be provided through four simple and related steps:

1. Paint ceilings and sidewalls in color with high reflection factors and provide floors with lighter color or finishes. (See table for recommended reflectances.)

2. Paint machinery and equipment in lighter colors with matte (non-gloss) finish.

3. Select luminaires with light finished exterior surfaces, with low brightness in the angle of vision, and with both upward and downward light distribution.

4. Reduce brightness contrasts within the field of vision. (See table for recommended brightness ratios.)

These four steps are related in that brightness contrasts are controlled principally through the reflection factors of the surrounding areas and by the brightness and light distribution of the luminaires.

Colors selected for machines and equipment can be made functional as well as useful in controlling brightness ratios. For example, one color can be used for the machine framework, a contrasting color for the work surfaces and areas, and a third color for moving parts. This will automatically give workers a new concept of their work areas, result in fewer accidents, and improve vision. And workers will soon learn to watch for moving parts by color recognition.

Recommended Surface Reflectances for Industrial Areas

Surface	Color	Reflectance
Ceiling	White	75-80%
Upper walls	Light green Light buff	50-55%
Lower walls and machines	Dark green Dark buff	25-35%
Immediate surroundings	Medium green Medium buff	35%
Floor	Blend with above	25%

Recommended Brightness Ratios for Industrial Areas

Ratio	Location
3 to 1	Between tasks and immediate surroundings
10 to 1	Between tasks and more remote surfaces
20 to 1	Between luminaires (or sky*) and surfaces adjacent to them
40 to 1	Anywhere within the environment of the worker

* Windows in exterior walls should be toned down by painting or otherwise.

LUMINOUS-SIDE, louvered fluorescent luminaires give upward component of light, good diffusion

CONTINUOUS-ROW fluorescent reflectors provide 50 ft.-c. to low-bay metalworking plant

Better Lighting Quality for Comfort

MORE AND MORE EMPHASIS is being put on the quality of artificial lighting. Quality relates to the characteristics of the illumination—its color, diffusion, direction (where important), direct and reflected glare, and other factors that affect its degree of comfort for the worker. Quality is also influenced considerably by the visual environment or surrounding area within the field of view.

Color quality of the illumination is controlled by the color of the light emitted by the light source and by the color of all surfaces in the area being illuminated.

For plants located in warm climates, cool colors, such as green, are desirable for walls and machines, with cool white light (4500°K. fluorescent, mercury vapor, etc.) from the light sources. In cool climates, warm colors, such as buff or tan, are usually preferred with warm-tone light sources.

Diffusion is important for general lighting, except for certain specific applications, such as inspection work where directional control aids in seeing flaws quickly and easily. Large-area light sources and an upward component of light directed toward the ceiling aid diffusion.

Direct glare is controlled by shielding with louvers, shields, prismatic control lenses, or other means. Reflected glare is diminished by large-area light sources of low unit brightness or by diffusing media, such as glass or plastics.

White ceilings and light-colored upper sidewalls with high reflectances add to the illumination efficiency. They also create a cheerful environment and aid in the science of seeing by reducing brightness contrasts within the field of vision of workers.

For many years, the measure of lighting quality has been primarily the measure of the illumination intensity, or number of footcandles. But lighting intensity is now recognized as only one of many factors to be considered. Lighting quality thus becomes a composite result of the harmonious combination of structural and decorative design with proper light sources, good lighting equipment, and recommended lighting intensities.

Modern, Efficient Light Sources

PROGRESS IN LIGHTING application has always been paced to a large extent by progress in development of electric-light sources. During the first half of this century, light-source efficiencies have climbed consistently from about 5 lumens per watt in 1900 to approximately 65 lumens per watt today. This rate of progress in efficiency rise, according to lighting specialists, is expected to continue.

Types of Light Sources

Current lighting standards for industry are based on three types of light sources: (1) incandescent, (2) mercury vapor, and (3) fluorescent. While light-source producers make a large variety of sizes, shapes, and colors of each, relatively few sizes and shapes, as given in the table on the next page, are widely used for general industrial lighting purposes.

Factors to be considered in selecting the light source for any specific lighting application include: color quality, lamp life, efficiency, control of light output, total lumens per lamp, and cost.

Incandescent lamps are point sources of light, and light distribution can be controlled quite accurately. Their emitted light is yellowish-white, or "warm". Rated life is low, but so is cost. Efficiency also is low, from 16 to 22 lumens per watt for sizes generally used, but total lumens per lamp are high. With high lumen output per lamp, less reflector units are required to light a given size area. This reduces first cost of equipment and tends to minimize both the maintenance problems and the cost.

Mercury-vapor lamps have long life, approximately double the efficiency of incandescent lamps, and high total lumens per lamp. Lamp cost also is high. These lamps produce a greenish-white light well suited for industrial lighting, especially for the heavy industries. One drawback is the appearance of the skin under this light.

A recent development is an inside-phosphor-coated, color-corrected mercury-vapor lamp (Type J-H1). It provides a satisfactory "white" light for most industrial applications. An even more recent development is this same lamp with a built-in reflector to provide its own light control without the need for a separate reflector.

Fluorescent lamps are line sources and excellent for diffuse light distribution. Rated life is high (7,500 hours for preheat-start types), and efficiency is about three times that of incandescent lamps. But lumen output per lamp is low, requiring more lamps for a specific area.

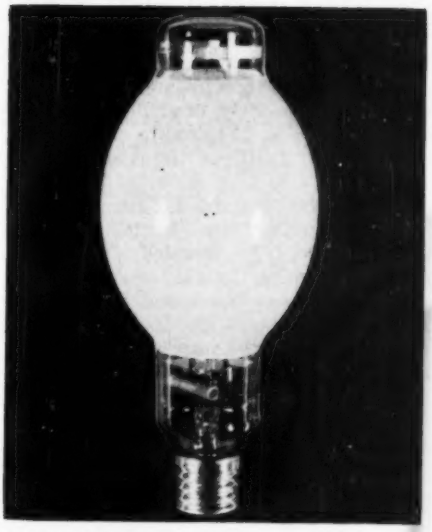
The color quality of fluorescent lamps is whiter than that of incandescent or mercury vapor. These lamps are available for industrial uses in varying degrees of "white"—warm, 3500° K., cool, and daylight (blue white). Considering their long life and high efficiency, lamp cost is comparable to or lower than those for other types of light sources.

Lamps Need Ballasts

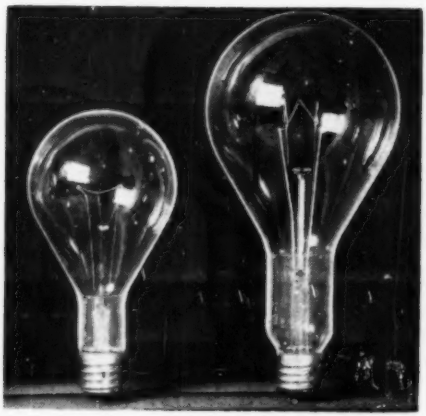
Both mercury-vapor and fluorescent lamps require auxiliary transformers (ballasts) for their operation as they are gaseous-discharge electric-arc-type lamps. The transformers, generally available for most of the popular distribution voltages and frequencies, can be made to specifications for other distribution ratings. Popular frequencies are 50 and 60 cycles; popular voltages are 120 volts, 199/216 volts, 480 volts, and 277 volts (phase-to-neutral of a standard 480/277 volt three-phase four-wire system).

Typical Light Sources for Industrial Lighting

Watts	Type Lamp	Lumens per Watt	Rated Life (hr.)
	INCANDESCENT		
100	A-21	16.2	750
150	A-23	17.3	750
200	PS-30	18.2	750
300	PS-35	19.5	750
500	PS-40	19.7	1000
750	PS-52	19.4	1000
1000	PS-52	21.5	1000
1500	PS-52	22.0	1000
	MERCURY VAPOR		
400	A-H1	40.0	4/6000
400	J-H1	45.0	4000
1000	A-H12	60.0	2000
1000	A-H15	52.0	3/4000
3000	A-H9	40.0	3/4500
	FLUORESCENT (Preheat Start)		
30	36" T-8	60.0	7500
40	48" T-12	63.0	7500
40	60" T-17	56.0	7500
85	60" T-17	60.0	7500
100	60" T-17	49.0	7500
	FLUORESCENT (Slimline)		
38	48" T-12	62.0	6000
55	72" T-12	65.0	6000
74	96" T-12	67.0	6000



***COLOR-CORRECTED** mercury-vapor lamp is coated inside with phosphorus to add red color*



***INCANDESCENT LAMPS** of 500 and 1,000 w. are standard units for industrial-lighting jobs*

***MERCURY-VAPOR** lamp of 400 w. has built-in reflector and rated life of 3,000 to 4,000 hr.*

Higher Lighting Intensities

ILLUMINATION INTENSITIES have historically increased by a geometric progression, approximately doubling in value every ten years. That rate of increase has proved itself to be economically sound.

When the standards for general lighting intensity are changed, the intensity should be doubled. It takes about ten years for this change to be justified through increased production, lower cost of lamps and lighting equipment, and greatly improved employee morale.

From the workers' viewpoint, small illumination increases have little if any effect on their ability to see more quickly and more easily. Doubling the intensity however gives definite results. Employees work more efficiently because they are able to see more clearly and faster, and they are happier at their work.

The amount of illumination required for any seeing task depends principally on the severity of the task. Quantity of light is of paramount importance, but quantity alone is not the entire solution. Seeing is a matter of *size*, *time*, *contrast*, and *brightness*.

Recommended Lighting Intensities for Industrial Areas

Foot-candles*	Seeing Task	Type of Area or Work
5-6	Rough	Inactive storage; passageways
12-15	Casual	Active storage; service areas; stairways; forge and welding shops
25-30	Ordinary	Moderately fine detail. Automatic-machine operation; rough grading; continuous processes
50	Difficult	Prolonged work, involving fine detail. Ordinary bench work and assembly; machine-shop work; finishing of medium-to-fine parts.
100	Very difficult	Precision work, involving fine detail. Fine assembly; high-speed work; fine finishing.
Over 100**	Extremely difficult	Finest precision work, involving finest detail. Extra-fine assembly; precision grading; extra-fine finishing.

*Minimum "in service" intensities, on task or 30 in. above the floor.

**General lighting level throughout work area. Supplementary lighting may also be used to provide similar intensities on local work areas where the general lighting level is 30 ft.-c. or over.

How Sight Is Affected

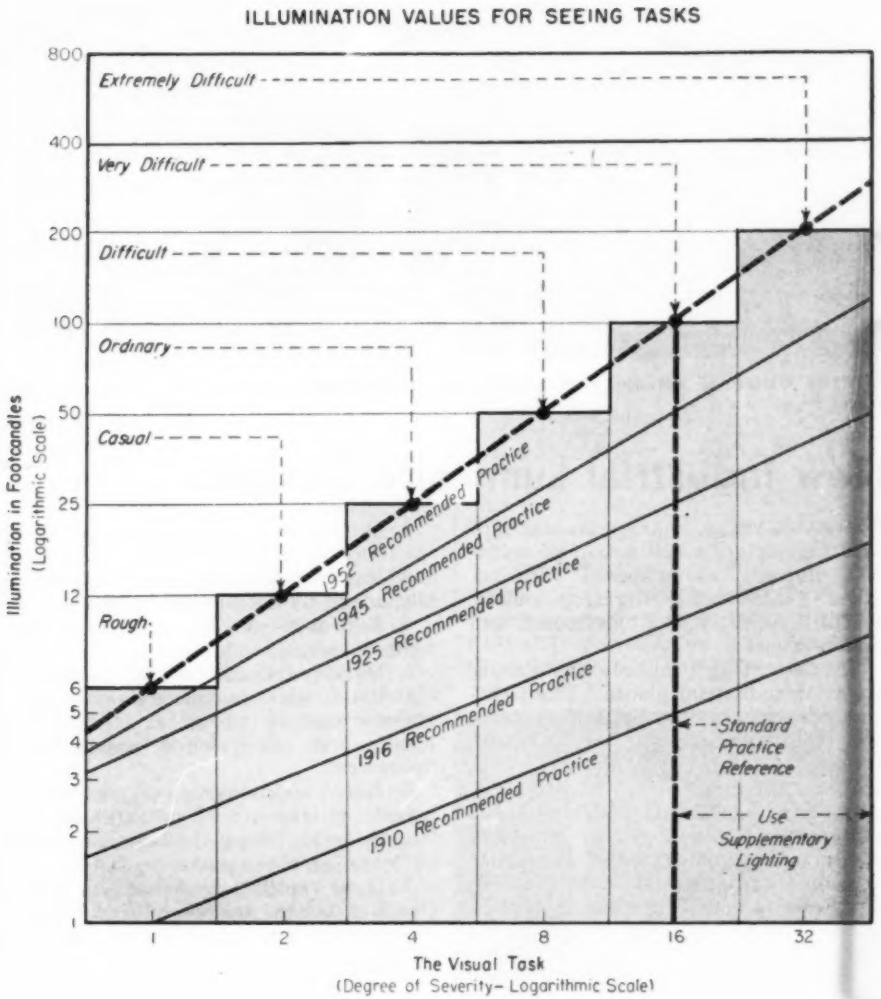
The size is fixed. Time is influenced by all factors that affect seeing. Contrast is a matter of improving the visual environment, as explained on preceding pages, and brightness depends on the amount of illumination falling on the seeing task.

Visual tasks for industrial areas have been divided into six separate classifications, or degrees of severity. These classes of severity have been made on the premise that if one task is twice as severe as another, that task requires twice the illumination that the other task requires.

Seeing-Task Classification

This premise was not made arbitrarily; years of research in thousands of work areas have substantiated it. Thus the six classifications of seeing tasks have been made so that each succeeding classification is approximately double the degree of severity of the preceding one. These six types, listed in the order of their severity, are: rough, casual, ordinary, difficult, very difficult, and extremely difficult.

Values of illumination listed for "extremely difficult" seeing tasks should be obtained, for reasons of economy, from both high-level general illumina-



tion and supplementary lighting near the work.

Thus the highest level of general lighting recommended applies to "very difficult" seeing tasks, as a reference line, with other classifications being proportionately lower. The above chart, giving "Illumination Values for Seeing Tasks", shows the current standards for lighting levels and the growth of accepted standards over the past 40 years.

EXTREME CONTRAST between modern-lighted bay and ill-lighted bay, in rear, shows what to expect from . . .

New Industrial Luminaire Designs

FOR MANY YEARS, it has been standard practice to place a distinction on industrial lighting as compared with so-called commercial lighting—offices, drafting rooms, school classrooms, and similar areas.

Yet the seeing problems are equally severe in industrial plants. The lighting industry has finally broken from this tradition and is now placing greater emphasis on improving the lighting in industry.

In recent months, lighting-equipment manufacturers have accepted industry's challenge to provide better industrial reflectors, or luminaires. The new designs vary in detail. But basically they provide certain essential new features found to be necessary for a high quality of illumination and an improved visual environment. These essential features are:

1. Semi-direct light distribution—with 15 to 40% upward light component.

2. Light finished exterior—30% or higher reflectance on all exterior surfaces, or low-brightness luminous sides.

3. Direct-glare shielding—for 45° shielding on all type units, or 30 to 45° shielding both laterally and longitudinally on all fluorescent luminaires.

4. Efficiency—65 to 75% over-all light output.

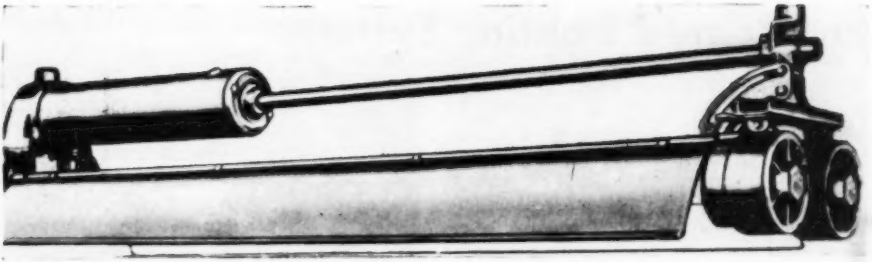
5. Durable reflecting surfaces—Alzak aluminum, white porcelain enamel, silver-mirrored or prismatic glass, and plastic and baked white enamel for fluorescent.

6. Easy maintenance — removable louvers or lenses, with quick access to lampholders, lamps, ballasts, starter switches, or other parts.

7. Good ventilation—to provide self-cleaning action and permit operation of lamps and ballasts at design temperatures.

8. Basic two-lamp (or multiple) unit —for two-lamp ballast operation of fluorescent luminaires.

Lighting engineers agree that industrial reflectors should provide an upward component of light but disagree over how much. Present reflectors therefore vary in their upward light output from 5 to 40%. The answer lies



***FLUORESCENT** luminaire for slimline lamps is explosion-proof and safe for hazardous places*

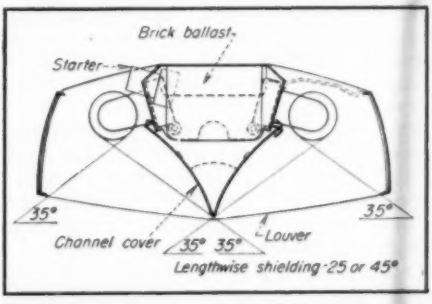
partly in the type of ceiling, partly in the type of work to be done, and partly on the level of illumination that is to be installed.

If the work involves only rough, casual or ordinary seeing tasks, less upward light will be satisfactory. The same is true if the ceiling is broken up by sawtooth design or by other structural details.

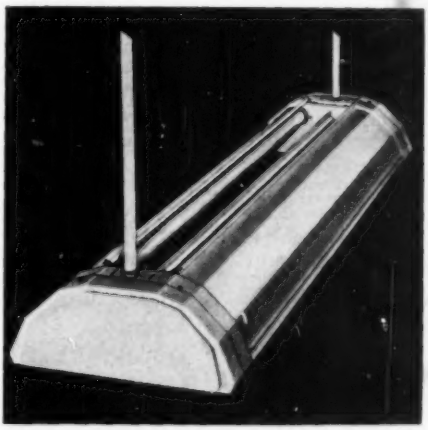
But if 50 ft.-c. or more are required for the seeing tasks, a high reflectance ceiling and from 25 to 45% upward component of light distribution should be provided. This amount of upward light is required in order to provide a satisfactory visual environment where high levels of lighting are directed on the work.

Many factories are today installing air conditioning in industrial work areas. Usually these areas are equipped with acoustical ceilings. When this is the case, recessed troffers properly shielded and louvered provide ideal lighting.

Some industrial production areas have been lighted by wall-to-wall luminous ceilings. These provide maximum light diffusion; where such diffusion is necessary for the type of work being performed, this more costly type of lighting system can usually be justified on the basis of greater production per man-hour. Added cost can be quickly offset.



***TRANSMITTING** part of the light upward, as this luminaire does, improves visual invironment*



***UPWARD LIGHT** is given off by this luminaire also; sides swing out for accessibility*

Engineered Lighting Systems

BETTER LIGHTING for industry is now possible because of the wide choice of lighting systems engineered for the particular job. There is now available a lighting system, or a lighting-equipment layout, to meet the most exacting needs for every type of industrial process or work area.

These systems are flexible in that they provide a range of unit-area costs, lighting intensities, lighting quality, and lighting flexibility. Adaptable to high-, medium- and low-bay applications, they can be selected for areas ranging in size from a small room to expansive plants covering actually acres of floor space in one open area. Size—large or small—is no excuse for poor lighting. Good engineering and well designed luminaires can supply kind and quantity of light needed.

Lighting systems may be selected for any one light source or for combinations of light sources—as a combination of incandescent and fluorescent. They may also be based on any one of a variety of lighting equipment, or reflectors, or on a combination of the different types of reflectors.

The systems range from individual luminaires (units) to continuous rows installed parallel or in grid pattern, to wall-to-wall luminous ceilings, to special applications of supplementary and inspection lighting devices.

Methods of mounting also vary, usually depending on room dimensions and ceiling construction. Principal mounting methods include: recessed, surface mounting on ceiling, and suspension from ceiling or roof truss. Luminous-ceiling installations form their own ceiling. Supplementary lighting devices are normally mounted on the machines or near the work areas that they illuminate.

General Lighting Systems for Industry

Individual Unit

Individual reflector units, installed on individual outlets. Used principally for intensities up to 30 ft.-c. on low mounting heights and in larger size units for both medium-bay and high-bay mounting.

Continuous Row

Fluorescent lamps in continuous reflectors. Used principally for intensities of 25 to 75 ft.-c. and for mounting heights up to 20 ft. Provides good diffusion.

Grid Layout

Continuous rows of fluorescent reflectors installed at right angles. Used principally for intensities of 75 ft.-c. and above. Provides excellent diffusion.

Luminous Ceilings

Ceilings formed of plastic or glass diffusing panels with fluorescent lamps installed in cavity above. Also ceilings formed of louvers in various patterns (louverall). Provides maximum diffusion.

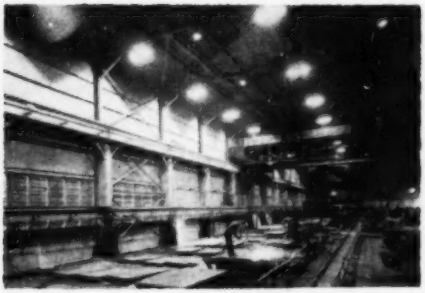
Inspection Lighting

Applications vary according to seeing tasks for the different inspection problems involved. Product being inspected determines the quantity and kind of lighting needed.

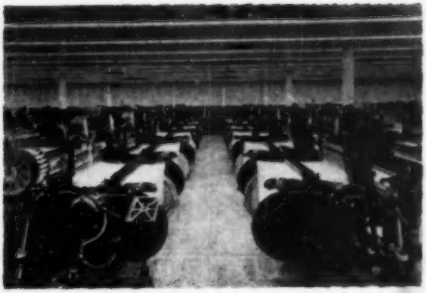
Supplementary Lighting

Normally provided by fixed or adjustable reflectors designed to focus a high intensity over a small work area and to supplement the general lighting.

How Different Lighting Systems Are Applied



INDIVIDUAL 3-kw. mercury-vapor luminaires light steel mill; incandescent lamps with reflectors add color correction

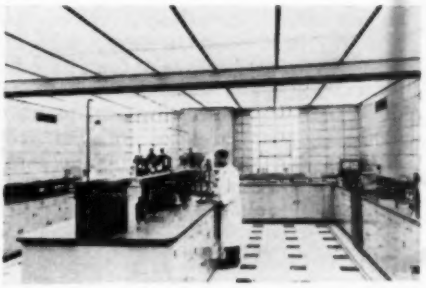


RECESSED TROFFERS in continuous rows light this sound- and air-conditioned textile plant with 70 ft.-c.

CONTINUOUS-ROW direct-indirect fluorescent 2/40-w. luminaires give 60 ft.-c. of good quality lighting in this polishing area

DIRECT-INDIRECT fluorescents provide good visual environment in high-bay crane area; ceiling is white, sidewalls are light blue

GRID LAYOUT of individual fluorescent reflectors give well diffused light of 60-ft.-c. to machines; upward component of light would help



LUMINOUS CEILING in pharmaceutical laboratory gives no-shadow, no-glare, evenly diffused light with minimum brightness contrast

Efficient Wiring for Lighting

A MODERN LIGHTING SYSTEM deserves an adequate and well planned wiring system. Such a wiring system should be designed so that, when full load is applied, full-rated voltage exists at the socket for incandescent lamps or at the ballast-lead connections for mercury-vapor and fluorescent lamps.

Single-phase two- and three-wire systems are normally installed for small lighting loads, while the three-phase four-wire system is more commonly employed for large lighting (and power) loads.

Full analysis of the distribution problems for each lighting installation, particularly where fluorescent or mercury-vapor lamps are considered, usually indicates economies with higher voltages and may indicate that a change in distribution system is desirable.

Recent trends are to higher distribution voltages for lighting and to wall-panel group control of lighting circuits. Higher voltages result in use of smaller wires, hence lower costs. Group switch control cuts wiring costs, insures predetermined lighting levels, provides more safety in switching.

Developments in Circuits

A typical example is the 277-volt branch circuit distribution system for lighting, first used in large aircraft factories in 1942. This is the phase-to-neutral voltage of a 480/277-volt three-phase four-wire power circuit. Further wiring economies were then effected through the development of the four-lamp ballast for four 100-watt T-17 fluorescent lamps.

A recent development has been the low-voltage (24 volts) remote-control relay and switch provision for switch control, which will operate any 240- to 280-volt ballast. Where lower voltages are required on this system, they are obtained with 480-volt step-down transformers to the required voltage.

***HIGHER FREQUENCIES** for fluorescent lamps permit small capacitor ballasts (right hand) to replace usual large ballasts (left hand) needed for fluorescent lamps*

Another forward-looking development in lighting is the use of higher frequencies, which simplify wiring and save materials. While energy is normally supplied to a community at a fixed frequency, converters can give higher frequencies when desired.

Fluorescent lamps produce about 25% more light at 360 cycles than at 60 cycles. And the size of the ballasts required for 360-cycle operation is only a small fraction of that required for 60-cycle operation.

A magnetic-type frequency converter has been developed for one large 360-cycle installation of slimline fluorescent lamps, converting the frequency from 60 cycles. Motor-generator sets also can provide other frequency transformations. This trend stands to develop rapidly, once its many possibilities and benefits are realized.

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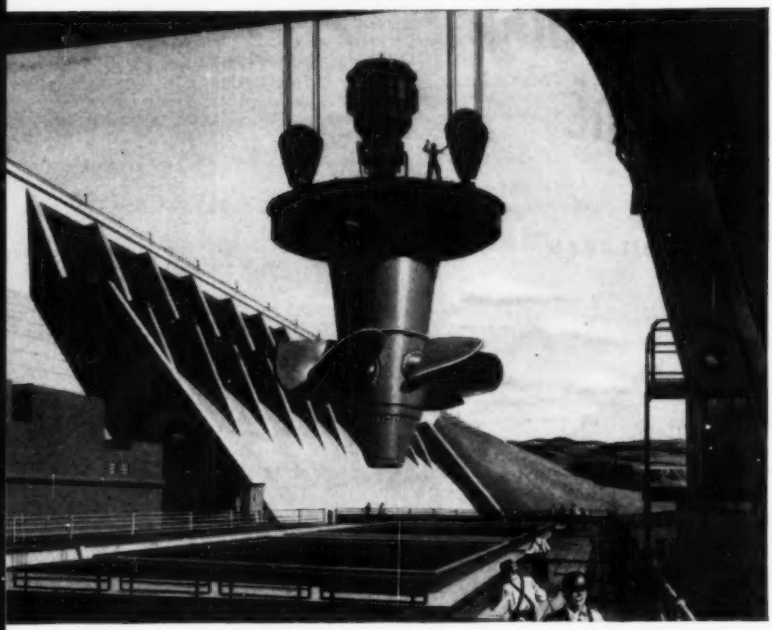

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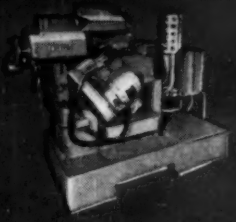

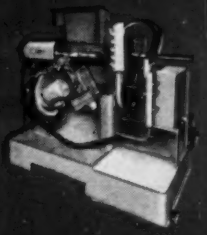

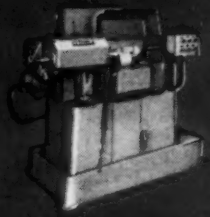

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from Manufacturers' Catalogs

7-1 Industrial Safety Equipment—Mine Safety Appliances Co. 190p. Complete listing of equipment for promoting safety and welfare of the industrial worker is contained in catalog 6-B.

7-2 Accounting Machine—Burroughs Adding Machine Co. 28p. Form S1002 describes an accounting machine that features fingertip change from one posting job to the next.

7-3 Foundry Mechanization — Link-Belt Co. 36p. How to mechanize a foundry for increased production, better castings, and improved working conditions is the topic of booklet 2439.

7-4 Graders, Tractors — Allis Chalmers, Tractor Div. 28p. Various types of motor graders, tractors, and power units are described in pamphlet MS441-A-5112.

7-5 Authority for Action—Business Week, 16p. Booklet tells how to reach top management in the U. S. with a sales story and analyzes management officials who influence company purchases.

7-6 Unit Heaters—Trane Co. 56p. Selection and application of blower-type unit heaters are explained in bulletin DS-327-A.

7-7 Industrial Chemicals—Oronite Chemical Co. 46p. Two bulletins are available; one describes phthalic anhydride, the other describes polybutene.

7-8 Cylindrical Grinders—Landis Tool Co. 16p. Design features and specifications of 6- and 10-in. precision cylindrical plain grinding machines are covered in catalog B-51.

7-9 Standby Emergency Power—Electric Machinery Mfg. Co. 20p. Requirements of standby power are fully covered in "E-M Synchronizer 35."

7-10 In-plant Feeding—International General Electric Co. 55p. Booklet (Z7)-26A-4 gives complete information on how to set up and operate an in-plant industrial food service.

7-11 Hitachi Products—Hitachi, Ltd. 48p. Products of Japanese organization ranging from electron tubes to heavy generators are described in this booklet.

7-12 Plastics Molding—Hydraulic Press Mfg. Co. 16p. Pre-plasticizing device that allows increased capacity of injection molding machines for plastics is described in bulletin 5206.

7-13 Vent Valves—Black, Sivalls & Bryson, Inc. 22p. Features of pressure-vacuum vent valves are listed in pamphlet E-601.

7-14 Screw Drivers, Nut Setters—Keller Tool Co. 32p. Complete description of line of air-powered screw drivers and nut setting tools is given in bulletin 613.

7-15 Diesels in Use—Cummins Engine Co., Inc. 24p. Case histories of diesel engines are given in Vol. 7, No. 2 of "The Dependable Diesel."

7-16 Foreign Power Projects — Kuljian Corp. 12p. Booklet R-4 tells how firm provides technical aid for foreign power projects.

7-17 Mine Feeders — Pioneer Engrg. Works. 20p. Booklet 630 covers complete line of manganese steel feeders for mines, cement mills, and quarries.

7-18 Calcium—Dominion Magnesium Ltd. 12p. Physical properties of calcium are given in pamphlet TIB-491.

7-19 Crane-cab Coolers—Dravo Corp. 24p. Bulletin 1301 describes equipment for supplying clean air to crane cabs under all atmospheric conditions.

7-20 Steam Generators—Clayton Mfg. Co. 12p. Form C-10.1 details applications of automatic, self-contained steam generators.

7-21 Flow Meters—Fischer & Porter Co. 40p. Variable-area flow-meter selection and sizing are simplified in booklet 10607.

7-22 Metalworking Equipment — E. W. Bliss Co. 28p. Catalog 35-C describes mechanical and hydraulic presses and special machinery.

7-23 Electric Furnaces—Volta Manufacturing Co., Ltd. 28p. Catalog AF & AFR-50 describes Voltarc melters for steel, iron,

PRODUCTION IDEAS (Cont.)

alloys, and gives data on accessories.

7-24 Molybdenum Lubricant — Climax Molybdenum Co. 44p. Lubricating properties and applications of molybdenum disulfide are contained in "Moly-sulfide".

7-25 Variable Resistors — Chicago Telephone Supply Corp. 38p. Details of complete line of composition and wirewound variable resistors are contained in catalog 70.

7-26 Metal Thresholds — Wooster Products, Inc. 28p. Information on various types of thresholds is contained in booklet 20-15.

7-27 Petroleum Engineers — Lummus Co. 16p. "Meet the Lummus Company" presents the people and properties of Lummus as a company and illustrates some of its jobs.

7-28 Process Control Instruments—Taylor Instrument Cos. 28p. Applications of control instruments in various processes are discussed in Vol. 4, No. 2 issue of "Taylor Technology".

7-29 Water-conditioning Data — Permutit Co. 116p. Data for those who work with water conditioning problems are contained in "Water Conditioning Data Book".

7-30 Hoist Equipment—American Hoist & Derrick Co. 32p. Complete line, including locomotive cranes, hoists, material elevators, car pullers, is featured in catalog GC-2.

7-31 Protective Lighting — Westinghouse Electric International Co. 24p. Complete plans for outdoor industrial lighting are provided in booklet B-4791.

7-32 Time-temperature Control — Minneapolis-Honeywell Regulator Co. 16p. Catalog 6020 describes an efficient approach to the problem of time-temperature control.

7-33 Process Machinery — Hardinge Co., Inc. 8p. Bulletin 100-A describes process machinery for mining, chemical, stone, mineral, paper, water, and sewage applications.

7-34 Grinding Information—Norton Behr-Manning Overseas Inc. 16p. Vol. 43, No. 4 of "Grits and Grinds" contains information on grinding wheel selection for in-feed centerless grinding.

7-35 Copying Equipment—Haloid Co. 18p. Four folders, X-251, X-4, X-5, X-6, describe xerography method of copying documents and illustrate with case histories.

7-36 Power Drives—Twin Disc Clutch Co. 24p. Applications of friction and hydraulic drives in the basic industries are contained in pamphlet PR-21.

7-37 Bridge-crane Buckets — Blaw-Knox Co. 44p. Four-rope buckets for handling bulk material are covered in bulletin 2392.

7-38 Air Diffusers—Anemostat Corp. of America. 64p. Manual 40 contains data for simplifying choice of air diffusers in air-conditioning systems.

7-39 Speed Reducers—De Laval Steam Turbine Co. 48p. Bulletin G-WWH describes double worm and helical-worm gear speed reducers and contains data on selecting reducers.

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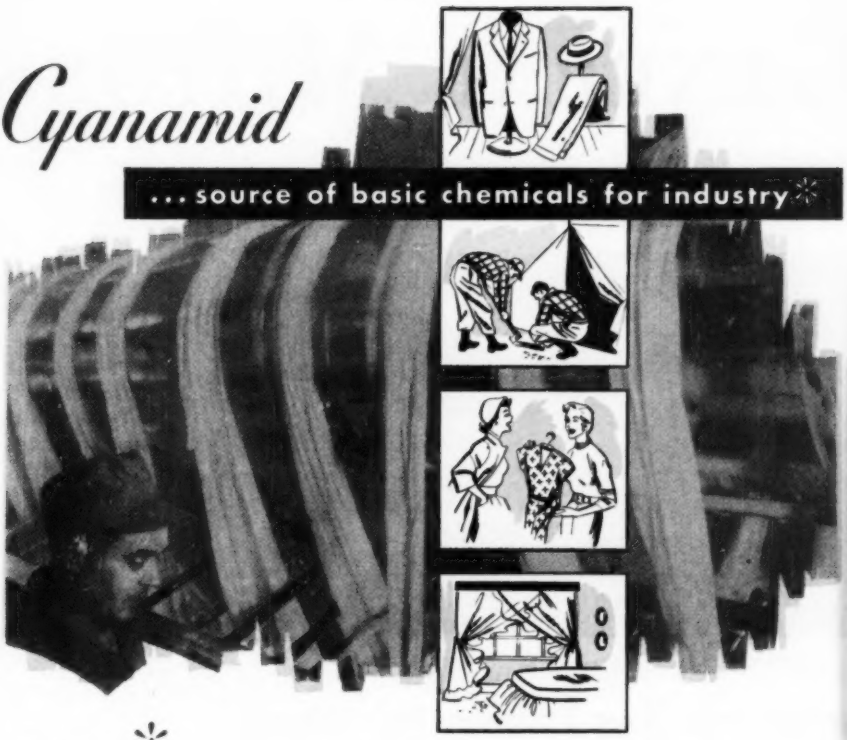

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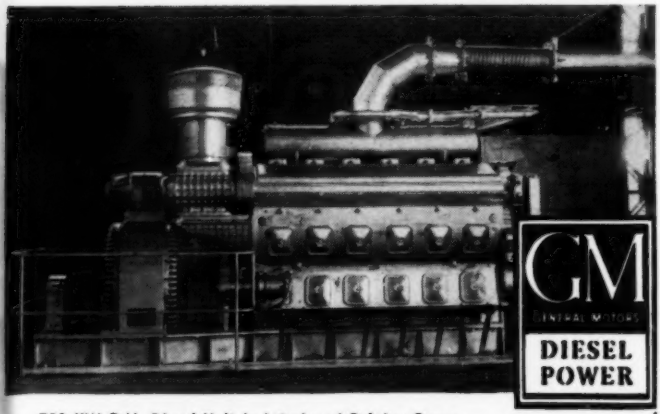

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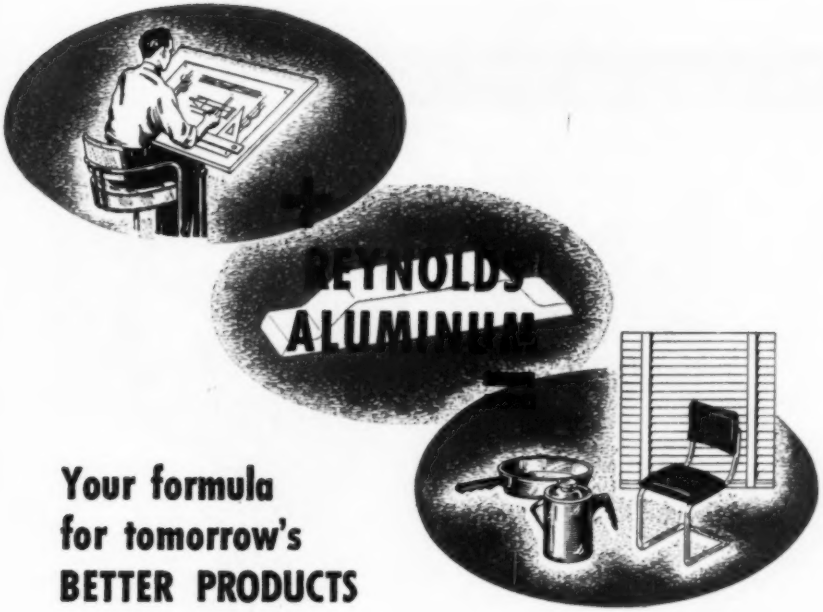

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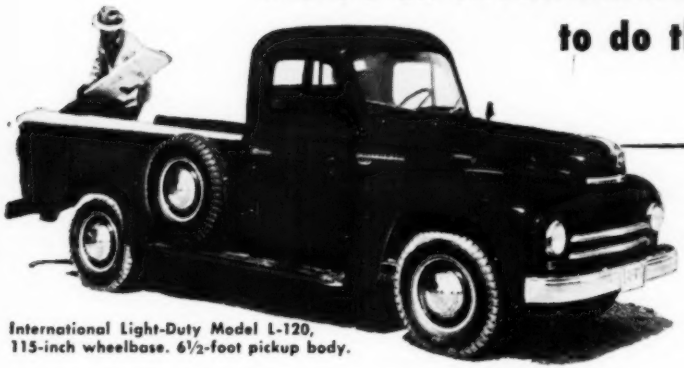

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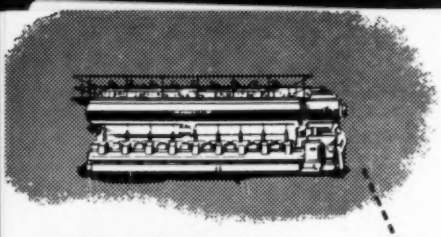

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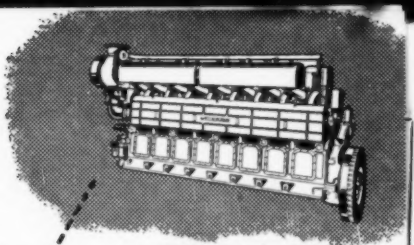

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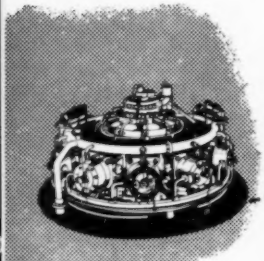

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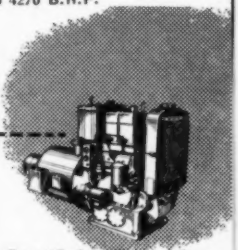

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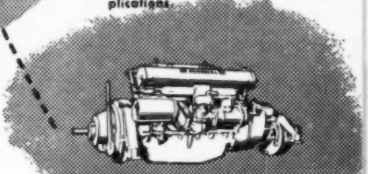

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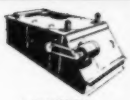

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